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NOTICES.—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Nitrogen Fixation at Billingham

THE description published in the *Times* of the Brunner-Mond process and plant for the fixation of atmospheric nitrogen at Billingham partly meets a suggestion made in THE CHEMICAL AGE that an achievement of such national importance should be made known to the public in terms the people of this country can understand. The article is in agreement with the rather more restricted terms in which the matter has been referred to from time to time in these columns. Enough is stated to make it clear that a scientific achievement of great public moment has been completed, without, however, disclosing any technical details of the process employed. It is common to speak of the process at Billingham as that of Haber, but we believe that the modifications are so important that it would be only justice to name it the Brunner-Mond process, and we hope that that name will come into general use. The writer speaks of the high pressure of 200 atmospheres as one of the great difficulties of the process to be overcome. Compared with ordinary engineering practice, such a pressure is undoubtedly high, but it is common to think of Haber's as almost a low pressure process compared with the 1,000 atmospheres pressure of the Claude process. The technical difficulties appear to have been overcome with great thoroughness, adequate provision is made for extension, and the national interest may be regarded as fully safeguarded by a piece of private enterprise worthy to rank with the best of which British firms are capable.

In this connection two enterprises in other countries are worthy of note. The adoption of the Haber process by the French Government may not be conclusive evidence against the Claude process, but it is certainly significant, as is also the importance attached by the French authorities not so much to the German process itself as to the fact that it is to be worked by expert German technologists. That was the difficulty our own Government had to face—not the lack of theoretical or chemical knowledge, but the want of the engineering and technical experience needed to convert theory into commercial practice. In addition to the French scheme, one now hears of the establishment at Merritton, Ontario, of a plant for the fixation of atmospheric nitrogen by the arc process described in patents held by J. S. Island. According to a correspondent of *The Journal of Industrial and Engineering Chemistry*, "plant and equipment have been secured, and the company proposes to manufacture nitric acid as a principal product, with a subsequent development of nitrates from the dilute portions which cannot be concentrated economically. The principal feature of the furnace used is the rotating electrode. A strong current of air is forced between the electrodes, causing the flame of the arc to be considerably extended. Another new feature is found in the type of packing used in the gas absorption towers. In contrast to crushed fillers, the plan used in this new plant is to fill the tower with small boxes each about 6 inches in section each way. The advantages claimed for this process are twofold: (*a*) uniform distribution of the liquid is obtained and the minimum quantity is therefore used; (*b*) more rapid cooling of the gases is insured. One of the principal economical features of the process is that the furnace may be operated intermittently, and as a consequence it will be possible to use off-peak power to a very considerable extent. This feature alone is considered to be of great importance from an operating standpoint." Little, if anything, is known here of the Island process, and further information would be interesting.

Developments in the Contact Process

THE marked changes which have occurred in the comparatively short period during which the contact sulphuric acid process has been operated on a commercial basis are set out in a concise and interesting manner by Mr. F. C. Zeisberg, the chemical engineer to the Du Pont Co., in a lecture which he delivered recently at the Carnegie Institute of Technology at Pittsburgh. Mr. Zeisberg, in reviewing the progress of the past quarter of a century, claims a good deal of credit for American chemists, and no one will deny that country the satisfaction of being responsible for

quite a number of devices which have added to the ease and efficiency of production. By the process of evolution the work of the early pioneers has become almost unrecognisable, and yet we are far too apt to forget the debt we owe to those who worried through their difficulties with the aid of limited and frequently indifferent materials.

In case our memories are bad it is worth while recalling that it was Davy who about the year 1812 first pointed out that platinum sponge suggested itself as a catalyst in the oxidation of sulphur dioxide, while some twenty years later Phillips laid claim to being the first person to put the suggestion on an industrial scale. Even then, however, the method did not meet with success, for difficulties which arose from the poisoning of the catalyst led to its abandonment. Undoubtedly the first workers to meet with technical success were Squire and Messel, who in 1875 succeeded in making "oleum" by utilising pure gases obtained by the decomposition of sulphuric acid on hot brick surfaces or by the combustion of sulphur, the sulphur dioxide afterwards being purified by washing with water under pressure. Squire and Messel, in fact, seem to have been the first to have appreciated the significance of catalyst poisons in the ordinary gas, while the German workers ultimately found a solution of the technical problem associated with the purification of ordinary converter gas from such poisons as arsenic, antimony, and lead.

In chemical engineering developments the American workers have certainly played a significant part. For instance, since the conversion of sulphur dioxide to trioxide is accompanied by the evolution of more heat than is necessary to raise the cold purified burner gas to the temperature at which the reaction begins a good deal of ingenuity has been displayed in means for recovering the excess heat. Systems of heat exchanges have now been in successful use for some time, and as another American development one cannot, of course, overlook the Cottrell electrical precipitator. It would seem, though, that Mr. Zeisberg's claims as to the influence of American design on the contact process should be restricted rather to the elaboration and improvement of details than to any modifications in the fundamental principles.

An American Tribute to Wembley

ONE of the best tributes yet paid to the British Empire Exhibition comes from Mr. F. W. Payne, co-manager with Mr. C. F. Roth of the Exposition of Chemical Industries to be held in New York in September of next year. Mr. Payne, who has had a long and wide experience in the organisation of chemical and other exhibitions, has spent a fortnight in London specially studying the organisation at Wembley, and has now left for a continental tour before returning to the United States. Paying a neighbourly call upon the editor of THE CHEMICAL AGE before leaving London Mr. Payne had nothing but praise and admiration for all he had seen at Wembley. His frank opinion is that from the educational side the Wembley exhibition is the finest the world has ever seen, a distinct advance on America's biggest efforts as embodied in the San Francisco and St. Louis expositions. So impressed is he, indeed, that he has written home to friends who are uncertain about coming over urging them on no account to miss so unique a spectacle.

Although not a chemist himself, he paid particular attention to the Chemical Section at Wembley, and regarded it as conveying a very effective picture of the range of British chemical production. The American expositions are frankly commercial to a large extent. Here the note is educational rather than commercial, and from this point of view Mr. Payne, through his long experience, has seen nothing to equal the collective series of exhibitions of which Wembley is composed. Mr. Payne was able, during his stay in London, to get in touch with various chemical interests, and was very appreciative of the courtesy received from every quarter. He hopes that at the New York Exposition next year there may be a group of exhibits representative of British chemical industry and chemical engineering. It might, in addition, be found possible to make a selection of items from the Scientific Section for exhibition at New York. The idea, at any rate, is worth consideration.

British Association at Toronto

THE visit of the British Association to Toronto in August next will be the fourth the Association has paid to the Dominion of Canada. The previous meetings were at Montreal in 1884, at Toronto in 1897, and at Winnipeg in 1909. This year, it is understood, active measures are being taken, both in Toronto and here, with the object of ensuring that the meeting shall afford an exceptional opportunity for intercourse between British, Canadian, American and European workers in science, and also for visiting members to become acquainted with the various scientific interests of the Dominion. Toronto itself is the headquarters of the Ontario hydro-electric system, whose laboratories in the city may be visited. This is the most extensive system in operation for the hydraulic development of electric power and its distribution. Its generating plant is at Niagara Falls. Toronto also possesses, in its drifting sand-filters, a system of water purification of considerable interest. The filters are within easy access of the centre of the city. The extensive harbour improvement scheme of Toronto, now in progress, will be found of considerable interest, especially to engineers. The improvement plans include a drive of 42 miles round the city and along its water front. Members of the Association are asked to note that the date originally fixed for the Toronto meetings has been changed to August 6-13, and that the official excursions will follow, instead of preceding, the meeting. As already decided, the annual meeting for 1925 will be held at Southampton. For 1926 an invitation has been received from the University and City of Oxford, which will come before the general committee in due course.

The provisional programme, as usual, covers a very wide field. The president this year is Major-General Sir David Bruce, who succeeds Sir Ernest Rutherford, and his presidential address will be delivered at the inaugural meeting on August 6. In the presidency of the Chemistry Section Professor Donnan will be succeeded by Sir Robert Robertson, the subject of whose presidential address will be "Chemistry and the State." The president of the Mathematics and Physics Section is Sir William Bragg. The close relation

between chemistry and physics and other branches of science is illustrated by the number of joint sessions for the discussion of problems affecting more than one branch. For example, the Geology, Engineering and Chemistry Sections will discuss together the question of "Liquid and Powdered Fuels." Two joint sessions of the Physics and Chemistry Sections will be held to consider respectively "Crystal Structures" and "Colloid Solutions." Another subject, "Vitamins and the Relation of Light to their Action," has been selected for a joint meeting of the Physiology and Chemistry Sections. The Chemistry Section itself will hold a conference on "Electro-chemistry," and the discussion will be followed by an excursion to the Niagara Peninsula, where various plants engaged in the electro-chemical industries will be visited. A transcontinental excursion for visitors will leave Toronto by special train after the meeting. At one of the stopping points, Saskatoon, a session of the Association will be held, during which a new chemical laboratory in the University will be opened. The Chemistry Section will also meet there, and a discussion on "Photo-chemistry" has been arranged.

The Association has done what is possible in the matter of travel and accommodation to make the visit to Canada economical and comfortable, and it is satisfactory to learn that British science will be well represented at the Toronto meetings. In addition to the presidential addresses of Sir William Bragg and Sir Robert Robertson, a number of well-known chemists appear among the selected speakers, including Professor Donnan, Professor E. C. Baly, Professor J. W. McBain, Professor J. C. Drummond, and others.

Water Gas from Bituminous Coals

THE production of water gas in America is, of course, a matter of much greater concern than it is in this country, but over here the process is by no means insignificant and plays an important part in the every-day routine of the majority of the larger towns gas undertakings. The main difference between the technical practice of the two countries is that while in America a non-caking or semi-bituminous coal is largely used for the purpose, in this country coke is almost exclusively employed. There is no doubt, however, that in both countries some considerable advance could be registered both as regards efficiency of gas-making and cost of operation if a really suitable process could be devised whereby water gas could be produced direct from bituminous coals. America has wrestled with the problem for some time, but in the past no great measure of success has been achieved. We have, however, just recently received from the U.S. Department of the Interior a report on some experiments which seems to indicate that the feasibility of utilising high-volatile bituminous coals for such processes has been demonstrated. The matter is, of course, of considerable economic significance to gas manufacturers in the central states of America, for the substitution of the cheaper bituminous coals in place of coke which has to be drawn from areas some hundreds of miles away would permit of very substantial savings in fuel costs.

The report states that a number of plants are now operating successfully with bituminous coal as generator fuel, and the results of the Bureau of Mines experiments seem to justify the statement of the investigators (Messrs. W. W. Odell and W. A. Dunkley) that the high-volatile coals can be used efficiently in the manufacture of water gas, although some trouble is to be anticipated with those varieties of coals which disintegrate when heated. One expects, of course, to meet with some drawbacks when dealing with innovations of the kind, and it is found that trouble may follow in the auxiliary apparatus when the sulphur content of the raw coal is high. In such cases more sulphur passes into the unpurified gas, which means an additional duty is imposed on the dry purifiers, and in those instances where purification capacity is limited an increase in the quantity of sulphur in the crude gas may introduce a serious problem. On the whole, however, any slight increase in purification costs is very much more than offset by the economy which is effected in the use of oil for carburation, and by the fact that in most localities coal is a much cheaper fuel than coke. In this country, of course, we look upon water gas plants rather from the standpoint of their influence on the coke market (for as coke-consumers they restrict the amount of coke put on the market) than from any particular virtue which they may have for consuming various classes of fuel, and we are, accordingly, not likely to give any serious thought to the question of feeding them with raw coal.

Points from Our News Pages

Some model answers to questions in the Final Examination in Alkali Manufacture of the City and Guilds of London Institute are furnished by an expert as a guide to students (p. 614).

A Board of Trade report on a carbon bisulphide still explosion which occurred in January at the Wigg works of the United Alkali Co., Runcorn, is published (p. 617).

In connection with the visit of French glass technologists to this country conferences were held in London and Sheffield, at which a number of technical problems were discussed (p. 618).

A general account is published of the nitrogen fixation plant at Billingham, and the prospects of future developments (p. 619).

Further notes appear on the Wembley Exhibition, where conferences were held this week by the Faraday Society and the Society of Dyers and Colourists (p. 621).

An interesting discussion is going on between Sir W. J. Pope and two American professors respecting a sulphuryl chloride process (p. 623).

Sir Ernest Benn, in his series of articles, deals this week with the question, "Are Profits Immoral?" (p. 623).

There are no points of material change to note in our chemical market report (p. 631).

The Calendar

June 15–21	Fourth Congress of Chemical Industry, organised by the Société de Chimie Industrielle, Paris.	Bordeaux.
17	Mineralogical Society: Papers by Professor Miklos Vendl and W. A. Richardson. 5.30 p.m.	London.
18	Society of Glass Technology: Papers by Percival Marson, F. W. Hodkin, and Professor W. E. S. Turner. 2.30 p.m.	The University, Sheffield.
19	Chemical Society: Ordinary Meeting. 8 p.m.	Burlington House, Piccadilly, London, W.1.
23–27	Twenty-Seventh Chemists' Exhibition.	Central Hall, Westminster, London.

Examinations in Alkali Manufacture

Model Answers to Questions

In THE CHEMICAL AGE *of last week we published a list of the questions set at the recent Alkali Manufacture Final Examination held under the auspices of the City and Guilds of London Institute, and drew attention to the comparative indifference to this important matter. With a view to encouraging interest in alkali works practice among the younger class of chemical technologist, we give below a set of model answers to the questions. The answers are not those of any examinee, but have been prepared by an expert with a view of showing how the various points might be treated.*

Question 1

Name the various grades of pyrites. What qualities of pyrites would you prefer to use, assuming these had to serve for the production of (*a*) sulphuric acid, (*b*) copper precipitate and (*c*) purple ore ?

Answer

The various grades of pyrites are iron pyrites and cupriferous iron-pyrites, and these are further classified, according to the presence or absence of arsenic as arsenical or non-arsenical pyrites. If pyrites are to be used for the production of (*a*) sulphuric acid, (*b*) copper precipitate and (*c*) purple ore, it is necessary to have regard to the economics of the several processes named, and the required quality of the final products. If sulphuric acid has to be sold as arsenic-free, it is desirable; other things being equal, to use cupriferous iron-pyrites as free from arsenic as possible. The Foldal pyrites and some of the qualities supplied by Messrs. Bachke, of Trondjhem, contain only traces of arsenic, and are capable of producing sulphuric acid commercially free from arsenic, without recourse to a dearsenication process, which is invariably very expensive. Foldal pyrites invariably contain a larger percentage of copper than those obtainable from most other Norwegian sources, and hence are more economical to work for the recovery of copper precipitate.

The essential consideration to bear in mind when considering pyrites from the point of view of purple ore is that the silica and phosphorus contents come within certain limits. Spanish and Portuguese pyrites usually contain a lower silica content than Norwegian pyrites, and are suitable as regards sulphur and copper contents, but invariably they contain 0·2 to 0·4 per cent. of arsenic, and hence involve the adoption of a dearsenication process. All things considered, the pyrites to be preferred for use when (*a*) non-arsenical sulphuric acid, (*b*) copper precipitate and (*c*) purple ore are required are the Norwegian pyrites, especially the Foldal quality. On the other hand, if one is content with arsenical sulphuric acid, the well-known Spanish Tharsis and Rio Tinto pyrites can be used, as they contain sufficient copper to warrant extraction, and the purple ore is quite satisfactory.

Question 2

Which process would you recommend for the manufacture of nitric acid—the vacuum process or the pressure distillation one ? Give the reasons for your answer.

Answer

There are advantages and disadvantages attaching to both the processes named. It is therefore necessary to weigh these carefully in the balance before making any recommendation.

The advantages of the vacuum process are :—

(*a*) Lesser quantity of fuel used at the still, owing to the reduced temperature at which decomposition occurs ;

(*b*) Less likelihood of loss of nitric acid in the event of a fracture of the earthenware apparatus ;

(*c*) Higher recovery ; and

(*d*) The stills have a longer life.

The disadvantages of this process are :—

(*a*) The greater initial capital cost of the plant ;

(*b*) More expensive to operate, owing to the cost of the continuous running of the vacuum pump and wear and tear of the latter.

The advantages and disadvantages of the pressure distillation process are practically the converse of the above. The advantages are :—

(*a*) Lower initial capital cost of the plant ; and

(*b*) Less expensive to operate.

The disadvantages are :—

(*a*) Greater quantity of fuel required at the still ;

(*b*) Possibility of greater loss by reason of fractures ;

(*c*) Recovery not quite so good ; and

(*d*) Lesser life of the still.

There is reason to believe that the pressure distillation process is the cheapest to operate, although the conditions under which the working is carried out, particularly when a fracture occurs, are not always the most hygienic. All things considered, the pressure distillation process is to be recommended.

Question 3

State what you know about the condensing apparatus of a hydrochloric acid plant. What volume of packing would you afford per ton of salt decomposed, and what type of packing would you adopt ?

Answer

It is important to remember that the condensing apparatus of a hydrochloric acid plant is affected materially by the cooling provision afforded. It is axiomatic that if strong acid is to be secured, two conditions must be ensured, namely, (*a*) adequate cooling of the apparatus must be provided to remove both the heat of the gases and the heat of solution, and (*b*) sufficient time contact and surface area must be provided to admit of equilibrim being attained.

The tendency of modern practice is for the provision of glass or vitreosil coolers and cooled absorbers, succeeded by packed towers, or smaller coke towers. Occasionally long pipe runs are arranged to admit of adequate cooling. These are followed by Yorkshire stone condensing towers, packed with various types of fillings. In some cases a series of Cellarius water cooled absorbers are provided, and these are followed by a suitable sized Yorkshire stone tower packed with coke or other filling medium.

The volume of packing necessary per ton of salt decomposed depends (*a*) on the type of saltcake furnace adopted, whether open or closed, and (*b*) on the type of packing medium used. According to past practice seventy cubic feet of packing must be provided per ton of salt to be decomposed. This is based on closed or blind roasters. A larger condensing space must be afforded with open roasters, or Mactear or other such furnaces.

The type of packing to be recommended depends on the free space and reaction surface provided per cubic foot of packing, and on the price per cubic foot at which the packing can be bought. The retention by the packing medium of a certain quantity of water or weak acid is desirable. This was one of the features urged by Hurter as a special advantage which the coke tower possesses, namely, its retention of so much liquid as to render harmless minor inequalities of working.

Question 4

What steps should be taken to ensure efficient extraction of copper from pyrites cinders ?

Answer

One of the essential steps to ensure efficient extraction of copper from pyrites cinders is to adopt the best type of chlorinating roasting furnace. It is generally agreed that the mechanical furnace of the Ramen-Beskow type is the best and most efficient. Two important principles are covered by this furnace :—(1) the exothermic heat developed during chlorination is sufficient to maintain the reaction to completion, and it is only necessary to apply a limited amount of external heat to start the reaction. (2) Continuous movement of the ore to be calcined is ensured. The movement of the mixture affords maximum conversion with minimum formation of "scars," which invariably contain a high percentage of insoluble copper.

Assuming the provision of a mechanical chlorinating roasting furnace, the other considerations to be observed in ensuring efficient extraction of the copper from pyrites cinders are :—(*a*) the correct degree of fineness of the cinders to be roasted should be determined and then strictly adhered to. The cinders should not be ground too fine, otherwise they will be more or less impervious to the percolation of the wash

liquor, and inefficient lixiviation will result. Cinders which are too coarse will not admit of the insoluble copper being converted to the soluble form with the same ease as the finer material. There is a specific degree of fineness common to each variety of cinders to be chlorinated. This characteristic must be determined by experimental screening tests, which should be correlated with the copper solubility of the calcined ore, as determined by systematic tests.

(*b*) The correct proportions of sulphur and salt in relation to the copper content should be determined and the ground ore fed to the hopper each shift should be scrupulously watched from these points of view.

The sulphur content should not be too high :—3½ to 4 per cent. is adequate when the copper content of the cinders is approximately 2·75 to 3 per cent. The salt content should not exceed 4·5 to 5 per cent.

(*c*) Certain temperature conditions should be observed in the operation of the Ramen-Beskow furnace. If these temperatures are not maintained, then the reasons of departure from them should be sought. These may be due to too intensive working, or to the presence or absence of too much sulphur. The conditions of the beds should receive constant attention. It is important to keep the beds free from scars. The removal of the latter can be effected easily by withdrawing the ordinary rabbles and substituting the ploughshare type. It is only necessary to stop the furnace a few minutes each day in order to ensure freedom from scars.

(*d*) Systematic lixiviation should be adopted. It is expedient to determine the water and acid soluble copper contents of the calcined ore, and to regulate the lixiviation process accordingly. The content of copper in the purple ore should be regularly determined and should not exceed 0·01 to 0·02 per cent.

Question 5

If saltcake and hydrochloric acid are to be produced from nitre cake and salt, in what form should the nitre cake be ? What type of plant would you recommend for the working of the latter mixture ?

Answer

It is desirable to grind the nitre cake to a fine degree along with the requisite quantity of salt, which is based on the free acid content of the nitre cake. Some works prefer to treat the mixture in a pot initially with a few gallons of water, and subsequently to push the material to the hearth of the roaster. Other works adopt the open roaster for working this particular mixture. The Six and Guttman muffle mechanical furnace using producer gas for the heating answers satisfactorily for this purpose, the constant rabbling produces a friable saltcake and a suitable high-strength acid can be obtained. With a nitre cake-salt mixture, continuous rabbling with the maintenance of an arch temperature of between 600 and 700° C. are essential if a satisfactory quality of saltcake is to be secured.

Question 6

The escape of a sulphuric acid plant is showing eight grains of SO_3 per cubic foot. What conditions would you expect to obtain on the plant, and what steps would you take to restore the plant to normal working ?

Answer

The conditions in question may represent a temporary disorganisation, or may be attributable to a dislocation of greater duration. If due to a temporary disorganisation one would expect one or other or a combination of the following conditions to obtain :—

(*a*) A reduced rate of nitrous feed to the Glover tower or reduced nitrosity of the nitrous acid.

Unusually high temperatures in the terminal chambers would arise from the foregoing if the dislocation was merely temporary.

(*b*) Absence of steam or atomised water. This would be revealed by high drips of unusual nitrosity, and the presence of chamber crystals on the sight glass.

(*c*) Irregular charging of the burners may be responsible for the dislocation.

If a continuous temperature record were kept of the gases entering the first chamber this would serve to reveal this irregularity. If the disorganisation was of a greater duration, then the temperature of the chambers and the drips would make this evident.

With a temporary dislocation it is not a difficult matter to restore the plant to normal working, as an increased feed of nitrous acid, or an increased nitrosity of the nitrous acid, or an increased supply of steam or atomised water, or the maintenance of regular charging, would restore normal working. If the disorganisation is of a more permanent nature, then the composition of the burner gases, the quantity of nitrate of soda being potted and in circulation in the nitrous acid, the quantity of oxygen in the exit gases, the condition of the chambers, and the operation of the burners, are all important points to which attention would need to be directed before it would be possible to take such steps as would ensure a restoration of the plant to normal working.

Question 7

A sample of chemical sheet lead which has been used in connection with a sulphate of ammonia saturator has become seriously honeycombed. To what cause would you attribute this, and how would you determine if the defect was due to the chemical sheet lead ?

Answer

The honeycombing of the chemical sheet lead of a sulphate of ammonia saturator may be due either to mechanical or chemical causes, although experience suggests that pitting of the character indicated is largely chemical. It may, of course, be the outcome of ordinary erosion. The presence of traces of nitrous acid in the sulphuric acid which is fed to the saturator is known to be one of the causes. Such honeycombing may be accentuated when the saturators are subjected to uneven strains such as are set up when rock salt is allowed to accumulate, or the saturators are frequently stopped and started. Crystallisation of the metal may arise, in which case the lead is more susceptible to pitting in the way indicated. The presence of zinc or antimony may account partially for honeycombing. Hence a determination of the presence or absence of the metals in question in an unaffected portion of the lead may constitute a clue of importance and offer an idea as to whether the chemical sheet lead is in a measure responsible for the defect.

Question 8

If only a 60 per cent. reduction is being secured in the reducing furnace of a sodium sulphide plant, what steps would you take to secure better results ?

Answer

A high efficiency in the reduction operation in sodium sulphide manufacture depends on several factors. The design of the furnace is one of primary importance. It will be assumed, however, that the furnace is satisfactory in all respects, and that the method of operation is not so successful as it might be. In the first place, it is important to ascertain what kind of flame is being used. Obviously, efficient reduction cannot be secured by an oxidising flame. Whether an oxidising or a reducing flame is being employed can be determined by the character of the flame and an analysis of the waste gases.

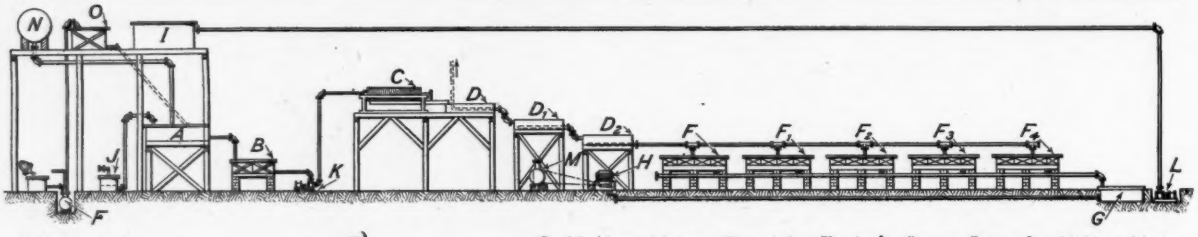
It is known that the reduction of sodium sulphate to sodium sulphide takes place rapidly after a specific temperature has been reached and the requisite reducing conditions have been attained. The critical temperature of the gases above the melt is 1,000° to 1,200° C. A pyrometer should be provided as a guide to the control of the temperature conditions of the furnace. It is also important to see that the proportions of saltcake to anthracite duff are satisfactory, that the two materials are thoroughly incorporated, and that the ash content of the anthracite duff is not excessive. Moreover, steps must be taken to prevent the re-oxidation of the sodium sulphide content of the melt after the latter has once been formed. This can be ensured by drawing the melts (and allowing these to cool) into hermetically sealed iron trays.

Question 9

How would you make muriate of ammonia (*a*) if you were in charge of an ammonia-soda plant ; (*b*) if gasworks ammoniacal liquor was available ? Answer and give a sketch of the plant for either (*a*) or (*b*), but not for both.

Answer

One method for producing muriate of ammonia from gasworks ammoniacal liquor is to produce caustic ammonia initially in a dissociator, and then to gravitate this liquid to an ammonia still, attached to which is a dephlegmator and



A. Saturator.
B. Receiving Tank for M/Amm. Sol.
C. Filter Press.
D, D1, D2 } Evaporators 7'-6" x 5'-6" x 1'-3"; 60'-0" of 2" lead pipe in each for steam.
F, F1, F2, F3, F4 } Crystallisers 9'-0" x 9'-0" x 1'-3".
G. Mother Liquor Receiving Tank.
H. Centrifugal.
I. Mother Liquor Top Tank.
J. Oxide of Iron Purifier.
K. Evans Pump for Press.
L. Evans Pump for Mother Liquor.
M. Shanks Engine.
N. Liq. Amm. Storage.
O. H.C.L. Tank.
P. Elevating Egg.

Diagrammatic Sketch of a Muriate of Ammonia Plant. Capacity, 7 tons per week.

condensing and absorbing plant. The temperature of the steam-ammonia stream leaving the dephlegmator must be carefully controlled in order to yield concentrated ammonia liquor of 25 per cent. ammonia content when the steam-ammonia stream leaving the dephlegmator is condensed.

The next procedure is to saturate the ammonical liquor with hydrochloric acid. A neutral solution should be aimed at. Concentrated ammonia liquor should be introduced through a cracker pipe contained in a Yorkshire stone tank, and the cracker pipe should be sealed to a suitable depth with hydrochloric acid. Operating in this way, loss of ammonia is obviated. After the neutralisation has been effected, it is necessary to filter the muriate of ammonia solution so as to remove the sulphide of iron and tarry matter. The removal of the iron is best effected as sulphide of iron, especially if filtration is to be facilitated. Hence the presence of a small percentage of ammonium sulphide in the concentrated ammonia liquor is desirable. The removal of the impurities named is effected by means of a filter press. Subsequently the filtrate of muriate of ammonia is evaporated in a cascade type of evaporation plant, closed lead steam coils being used.

When a content of 35 per cent. NH_4Cl has been secured, the solution is run off to the crystallising tanks, where it remains for about thirty-six hours. Subsequently the mother liquor is tapped off and returned to the saturator for utilisation. The crystals of muriate of ammonia are centrifuged and packed in suitable casks ready for sale.

A sketch of a typical muriate of ammonia plant is shown above.

Question 10

It is desired to manufacture bleaching powder at a point where salt is found. What process would you recommend in such circumstances? State the probable efficiency of the plant you recommend.

Answer

The decomposition of salt—either electrolytically or by means of 80 per cent. sulphuric acid—involves the manufacture of products other than bleaching powder. In one case caustic soda would be produced and hydrogen would be available, quite apart from the chlorine required for the production of bleaching powder. In the other case saltcake would be produced, and the hydrochloric acid recovered could be converted to chlorine as a primary material for the production of bleaching powder, either by the Weldon process, in which manganese dioxide is used, or by the Deacon's process, which affords an excellent illustration of the application of a catalyst. The catalyst employed is cupric chloride.

The process to be adopted therefore depends essentially on the question of the demand, either for saltcake or caustic soda, in the locality in question.

Given a suitable market for caustic soda, the adoption of an electrolytic caustic soda plant (Allen-Moore cells) would be recommended. Such a plant would give approximately a 92 per cent. yield in the matter of caustic soda, and an efficiency of 90 per cent. from the point of view of bleaching powder. The absorption plant for effecting the combination of the chlorine with the slaked lime should be of the Rudge revolver type, which has been proved superior in practical operation to that of the Hasenclever.

Birmingham Pulverised Fuel Installation

WHILE the use of pulverised fuel is now being largely urged on the ground of its efficient utilisation of the full calorific power of raw fuel, and incidentally as a solution of the smoke problem, it is interesting to note that the Vickers and International Combustion Engineering, Ltd., of Africa House, Kingsway, London, W.C.2, have received an order from the City of Birmingham Electricity Department for a complete pulverised fuel installation for the Nechells Power Station.

The plant is to consist of six Vickers-Spearing boilers, each having 5,400 sq. ft. of heating surface, to give superheated steam at 325 lb. per sq. in. Each boiler will have a Lopulco type combustion chamber fitted with a patent water screen to ensure that the fine ash is deposited in the form of dry dust. The side walls have also passages for heating the secondary air which passes into the chamber through ports situated in the front wall, and which is about 85 per cent. of the total air of combustion. There are to be four bunkers of steel plate construction, with necessary sliding gates to receive the raw fuel and pass it to the four gravity type dryers, which reduce the moisture in the coal to about 5 per cent. by utilising the heat of the waste gases from the boiler flues. The fuel is to be pulverised by four patent Raymond roller pulverisers, each having six rolls, to reduce the fuel to such fineness that 90 per cent. will pass through a 100-mesh sieve and none be left on a 40-mesh sieve. Each pulveriser will be complete with fan, cyclone and piping, and there will be two compressors and apparatus to convey the fuel from the pulverisers to bunkers above the boilers. The powdered fuel is to be fed by six groups of Lopulco feeders, each with four screws and operated by variable speed electric motors. These are placed immediately above the burners which rest on the suspended arch of the combustion chamber. Combustion is to be carried out with 24 Lopulco burners, each giving the flat flame which is peculiar to the system and which is projected vertically downwards at such a rate that it turns upwards a few feet above the water screen at the bottom of the combustion chamber. The operation of this installation will doubtless be watched with interest, as it is the largest order that has as yet been placed in this country for pulverised fuel firing. A significant point is that the placing of the order has followed immediately after the visit of Mr. R. A. Chattock, M.I.E.E., the City Electrical Engineer, to U.S.A. and Canada, where he was able to see many pulverised fuel installations.

Relations Between Government and Industry

MAJOR HARRY S. KIMBERLY, formerly of the United States Chemical Warfare Service, has organised "The Washington Commercial and Research Service," to give manufacturers in the dye, chemical and related industries a personal representative in the national capital. The new organisation, it is announced, purposes to keep manufacturers in these industries informed on the many things affecting their interests that are happening in Government departments, including research, and in Congress. The service will also act as the representative of the manufacturers in any ordinary matter they may want taken up with any branch of the Government.

A Carbon Bisulphide Still Explosion

Board of Trade Report

THE Board of Trade have issued a report of a preliminary inquiry into a carbon bisulphide still explosion which occurred on January 9 at the Wigg Works of the United Alkali Co., Ltd., Runcorn.

The still, it is stated, was a cylindrical vessel 4 ft. 6 in. internal diameter and 4 ft. 6 in. long, constructed throughout of mild steel plate ⅜ in. thick, with a longitudinal welded seam. The bottom was a flat circular mild steel plate, ⅜ in. thick, butt-welded to the cylindrical shell by the open fire process. The cover was a flat mild steel plate ⅜ in. thick, secured by 56 bolts, ⅝ in. diameter, to a 3 inch angle iron ring which was riveted to the top of the shell. On the cover were three neck-pieces, one of 2 in. bore leading to the 1 in. diameter U safety lute pipe; one 3 inches bore leading to a 2 in. bore wrought-iron pipe for gas outlet to condenser, and one 2 in. bore to the air vent cock, for destroying vacuum. On the shell was a neck piece for the 1 in. bore wrought-iron liquor filling pipe. There is also a similar neck for the steam inlet to the 1 in. bore lead coil which lies on the bottom inside the still. From this an outlet branch near the bottom of the shell leads to the atmosphere through a drain pipe fitted with a ½ in. diameter screw-down stop valve.

The still was made by Thompson Brothers, Ltd., Bilston, Staffordshire, in April, 1918. It was supplied to one of the United Alkali Company's other works in the district, and afterwards removed to the Wigg Works for use as a carbon bisulphide still in January, 1920. Nothing other than the usual running repairs to the still appear to have been required, and no trouble was experienced from the time it was erected until the explosion occurred.

From various accounts the noise of the explosion was terrific, but the material damage to the plant was of little account. The bottom of the still was blown out in one piece. The remainder of the still broke away from its connections and landed on the top of one of the agitator tanks, which was about 13 ft. in height and about 20 ft. from the site of the still. The contents of the still were scattered about and caught fire, which was put out at great risk, but fortunately without further accident.

The explosion appears to have been caused by over-pressure of carbon bisulphide gas within the still, owing to the two outlet pipes having become blocked with ice during a frost which prevailed at the time of the accident.

General Remarks

Carbon bisulphide, in the manufacture of which the still was used, is an extremely volatile and dangerous chemical substance. The regulations governing its transport are most stringent. The responsibility for conveying it from the place of manufacture has to be borne by purchasers, and insurance companies refuse to accept risks, either for the material or that part of the works where it is manufactured. For these reasons the plant was placed on a piece of marsh land between the River Mersey and the Manchester Ship Canal, as far away from the town and human habitation as possible. The operators were reliable men specially selected by the manager, Mr. G. T. Wainwright, who himself has had 44 years' experience of this work, including over 25 years as manager. The men were fully aware of the dangerous nature of the liquor they were handling, and notices prohibiting the use of naked lights were placed around the plant. Portable electric lamps were provided, in addition to the fixed electric incandescent lights. The plant for the manufacture of carbon bisulphide was erected about 25 years ago, and it had been in constant use for the whole of that period, with the exception of nine months of trade depression, after which working was resumed on November 28, 1923. From then it was worked continuously until the time of the explosion at 10.30 p.m. on January 9, 1924. The still was the smaller of two pure or refining stills which worked independently as required. These stills were filled with the required amount of crude carbon bisulphide from the crude liquor tank, the time to run in being checked, as no gauge or other means for ascertaining the quantity of liquor in the still was provided. The cock on the outlet pipe for the evaporated carbon bisulphide was opened, and steam was turned on through a ½ in. diameter screw-down stop-valve which admitted steam to the 1 in. bore lead coil on the bottom of the still. A ½ in. diameter drain valve was fitted to the outlet from this coil. This fitting was necessary in case the lead coil within the still gave way, when the valve would be shut to stop the flow of carbon bisulphide from escaping through the drain to the atmosphere, where it might possibly burst into flame. Steam to the coil was supplied from boilers situated at a distance of about 300 yards away from the stills, and on which the safety valves were adjusted to lift at 75 pounds per square inch. The drop in pressure would therefore be considerable, but there was no pressure gauge on the steam pipes near the still by which it could be ascertained.

The still was not intended to withstand any working pressure beyond that provided for by means of a U safety pipe, which was luted with pure fresh water only, having a head of about 5 ft.

The outlet for the evaporated carbon bisulphide was through lead coils in an open top water cooled condenser, passing to an open-ended wrought-iron pipe, through a layer of water about 12 in. deep which floated on top of the liquor in the final storage tank. The plant for manufacturing the crude liquor was operating continuously, whilst the refining stills could deal with the whole output by intermittent working. At the time of the accident only the small still—from which the explosion occurred—was in use. Owing to the exposed position of the plant, and the excessively low temperature which prevailed, it can only be conjectured that both the U-pipe water lute and the outlet pipe from the still condenser had become blocked with ice, and the still continuing to work, a pressure of carbon bisulphide vapour arose which was sufficient to cause the destruction of the still. A non-freezing liquid would not be suitable for luting the safety U-pipe owing to the action which it would have upon the liquor being treated. At the end of every charge a vacuum was created by condensation within the still, when the contents of the U-pipe were drawn in. It was therefore necessary to refill the U-pipe with fresh water on every occasion before the still was operated. The precaution has now been taken of passing the U-pipe within a large jacketed case which contains also the steam pipe leading to the still coils. The U-pipe outlet must be carried out clear of the plant, but the precaution has been taken to lead it downwards so that no water can lodge in it beyond the lute required. This arrangement will, it is thought, overcome the possibility of a recurrence of the accident.

Observations of the Engineer Surveyor-in-Chief

It is clear that the explosion was due to over-pressure apparently brought about by the vapour outlet, and the water sealed relief pipe being closed through frost. No provision was made to prevent the freezing up of the relief pipe, and having regard to the exposed position in which the plant was situated, and the fact that it was worked continuously at night as well as through the day, it is surprising that the still should have been in use for so many years without mishap. The proposal to steam-jacket the safety U-pipe will, if acted upon, prevent the freezing of the water contained therein, but for the pipe to be completely satisfactory as a safety device means should also be provided for ascertaining positively at any time while the still is in use that it is clear of obstruction and free to discharge should overpressure occur. Unfortunately, owing to the very inflammable nature of the contents discharged from the still, the attendant was so badly burned that he died from his injuries.

Dyestuff Licences for May

THE following statement relating to applications for licences under the Dyestuffs (Import Regulation) Act, 1920, made during May has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee:—

The total number of applications received during the month was 596, of which 491 were from merchants or importers. To these should be added 32 cases outstanding on May 1, making a total for the month of 628. These were dealt with as follows: Granted, 476 (of which 429 were dealt with within 7 days of receipt); referred to British makers of similar products, 136 (of which 117 were dealt with within 7 days of receipt); referred to reparation supplies available, 7 (all dealt with within two days of receipt); outstanding on May 31, 9. Of the total of 628 applications received, 553, or 86 per cent., were dealt with within 7 days of receipt.

French Glass Technologists' Visit to England

Conferences in London and Sheffield

DURING the last week of May a party of some twenty members of the Chambre Syndicale des Maîtres de Verreries de France paid a visit to England at the invitation of the Society of Glass Technology, thus returning a visit paid last year to France by members of the British Society. The programme included visits to glass works, to Harrow School, to the British Empire Exhibition at Wembley, and to the Department of Glass Technology of the University of Sheffield. The delegates were also entertained to dinner in London on the occasion of the annual dinner of the Society. The other guests were Dr. E. F. Armstrong, F.R.S. (President of the Society of Chemical Industry), Judge F. E. Bradley, LL.D. (Master of the Glaziers' Company), Mr. J. Holland (President of the Ceramic Society), and Dr. Baring Horwood (Master of the Glass Sellers' Company).

During the week two meetings were held. The first was in University College, London, and was a joint meeting with the British Society of Master Glass Painters. The President of the latter society, the Earl of Crawford and Balcarres, was in the chair, and was supported by Colonel S. C. Halse, President of the Society of Glass Technology. Three papers were presented.

The Problem of Glass Decay

Dr. Ethel Mellor, in a paper entitled "The Decay of Window Glass from the Point of View of Lichenous Growths," gave an interesting account of the acceleration of the decay of glass in ancient stained glass windows by the growth of lichens which made their habitat on the glass. Numerous specimens of these were exhibited and the paper was illustrated by a number of slides.

Mr. Noel Heaton, B.Sc., contributed a paper on "The Decay of Mediæval Stained Glass." He referred to the wide variations in resistance to decay found in mediæval stained glass. This was attributed mainly to variations in the composition and physical structure of the glass used. Window glass was introduced by the Romans, who arrived at a very sound composition, and their glass was remarkably durable. Analyses of glass of different periods revealed the differences in composition which resulted from a departure from the Roman tradition in mediæval times. The resulting loss of durability was illustrated by a series of slides. The lowest ebb was reached about the end of the fourteenth century, one of the most notable examples being the glass of York Minster, which was in such an extreme state of decay as to require the most careful supervision in its repair. In the process of decay two causes operated simultaneously—surface weathering due to atmospheric action, and well-defined pitting due to the structure of the glass. The variation found in stained glass of the same period was attributed mainly to primitive methods of manufacture, with certain affecting causes. It was characteristic of mediæval glass that the painted portions resisted decay better than the glass itself, which might be attributed to the lead silicate used uniting with the glass to form a more durable composition. The reverse was the case in later times, the enamel often perishing whilst the glass remained sound.

The last paper was on "The Weathering and Decay of Glass," by Professor W. E. S. Turner, D.Sc. Ancient observers, he said, attributed the decay of glass to various causes, some to the moon, others to the sun. Even as recently as 1879, James Fowler, in his well-known treatise on this subject, made a minute examination of the decay of glasses of different epochs without being able to come to any precise conclusion. But the nature of the corrosion of glass had been methodically studied by the physical chemist, and the principal causes were now fairly well known. The chief agent of the action of the atmosphere was moisture. All glassware absorbed moisture to an extent dependent in the first place on its composition, but partly also on the manner in which it had been treated by the workman. Glasses with little stability were those which contained excessive proportions of alkaline oxides, whether of sodium or potassium. Glass of the type, silica-soda-lime (such as window glass and ordinary sheet glass) which contained more than 18 per cent. of sodium oxide, too readily decayed; at the same time the presence of at least 2 per cent. of potassium oxide permitted the total alkaline oxides to be increased to 20 per cent. without serious danger. The components which increased the resistance to decay of ordinary glasses were silica, lime, alumina, and magnesia. Boric oxide was also very beneficial in a proportion of less than 12 per cent. The eventual hollowing out and the furrowing of glass in process of decay were associated with the mechanical treatment which it had received.

Conference at Sheffield

A second meeting was held in the Applied Science Department, Sheffield University, Colonel S. C. Halse, in the chair. The following papers were presented:

"*Alumino-Silica Minerals in Fired Glass Pots*," by W. J. Rees, B.Sc. Tech., F.I.C.—It was stated that N. L. Bowen and J. W. Greig, of the Geophysical Laboratory, Washington, U.S.A., had recently revised the investigations previously made on the binary system Al_2O_3:SiO_2. They showed that there was only one compound of alumina and silica which was stable at high temperatures. This compound had a composition $3Al_2O_3$:$2SiO_2$, and chemically was quite distinct from Sillimanite (Al_2O_3:SiO_2), although its optical and crystallographic characteristics were almost the same. The crystals of so-called Sillimanite which were found in the different kinds of fired refractory material and in the ceramic articles were always crystals of the compound $3Al_2O_3$:$2SiO_2$. Researches made by the author during the firing of pots and blocks for glass works, as well as during their use at high temperature, corroborated the results obtained by Bowen and Greig. The proportion of $3Al_2O_3$:$2SiO_2$, which was found in refractory materials after firing depended upon the composition of the material, upon the degree and duration of the heating, and upon contact with, or absorption of, siliceous matter such as glass.

"*The Effect of Various Constituents on the Viscosity of Glass*," by S. English, M.Sc.—To the glass manufacturer, the author stated, the viscosity of molten glass is perhaps the most important of its properties, as it is the viscosity and the way in which it varies with alteration of temperature that determine whether a glass can be satisfactorily melted, planed, and worked. Though the importance of this property has been realised, the practical difficulties of measuring the viscosity at temperatures up to 1,400 have prevented the subject from being systematically investigated. Results have been published of only a few determinations, and the data provided do not always appear to be consistent, though it is not easy to test this point as the composition of the glasses are not generally given. Of the various methods which have been used or suggested for the determination of the viscosity of liquids the "rotation" method seems to be the most useful for glass, as it can be used over such a large range of viscosity. In applying this method, the glass was melted from cullet in a standard-sized cylindrical crucible, and an iridio-platinum sheath secured on the end of a porcelain rod was rotated on its own axis in the centre of the crucible of glass. The time required for the iridio-platinum sheath to complete one rotation under different loads at various temperatures was determined, and the viscosity was given as a function of the product of the net effective pull and the time of rotation. The apparatus was calibrated by using syrup, the viscosity of which had been previously determined. The glasses used consisted of a series of soda-lime-silicates obtained by a molecular substituting lime for sodium oxide in a simple sodium silicate, and a similar series in which the sodium oxide was substituted by magnesia. The curves for the viscosities from about 750° to 1,400° C. show the way in which the viscosity is increased by substitution, and decreased by a rise of temperature.

"*The Thermal Endurance of Glass*," *Part I*, by V. H. Stott, M.Sc.—In spite of its practical importance the theory of the thermal endurance of isotropic bodies had been somewhat neglected. A theory was submitted, which, however, owing to the complexity of the phenomena involved was necessarily not entirely satisfactory. Actually it was possible to increase the thermal endurance of glass by a suitable thermal treatment, but a general method for effecting this could not be given. Another question of practical utility, which could not be determined in a general way, was that of finding the shapes of glassware which were most resistant to thermal shock in the limits imposed by usage. Here, again, each case had to be specially considered. It seemed, therefore, that, from the

point of view of thermal endurance, they could choose a glass which suited a given purpose according to its physical properties, but it was most difficult to determine the best process of manufacture for an actual article, or to arrive at a proper method of testing the value of the object made. It was, therefore, not desirable at present to fix any formal method of testing.

In Part II of the paper, by V. H. Stott, M.Sc., and Edith Irvine, B.Sc., it was stated that experiments were made which showed that rupture was generally due to local differences of temperature, rather than to the uniform shrinkage of large surfaces. Although this interpretation of the experiments showed that the conditions assumed in the first part of the paper were not strictly fulfilled, the effects of the different factors were not greatly changed, and the formula cited would give satisfactory comparative results. In particular, since rupture was almost instantaneous, the conductivity of glass could not have great importance.

Prior to the meeting in Sheffield the French delegates were the guests of the Society of Glass Technology at luncheon, and in the evening a motor trip was made to Haddon Hall via Chatsworth Park.

Nitrogen Fixation at Billingham

A Sketch of the Brunner-Mond Achievement

ALMOST simultaneously with the announcement in THE CHEMICAL AGE of the great success of the Brunner-Mond process for the fixation of atmospheric nitrogen at Billingham, *The Times* publishes a review of the firm's achievement based, we believe, on a personal inspection of the works by the writer.

Until comparatively recently, he points out, the two main sources for the supply of fixed nitrogen were natural deposits of nitrogenous compounds, of which the nitrate beds of Chile are by far the most important known, and the ammoniacal compounds obtained as a by-product in the manufacture of lighting gas and coke from coal. Within the last generation, however, science and engineering have found a third way of providing a supply by the fixation of atmospheric nitrogen. For this there are three principal methods :—

(1) Combination of the nitrogen and oxygen of the air in the electric arc to form nitrous oxides ;

(2) Transformation of calcium carbide into cyanamide by exposure to nitrogen at a high temperature ;

(3) Direct union of nitrogen and hydrogen to form ammonia.

The first two of these methods differ from the third, which is that commonly associated with the name of Haber, in being essentially electrical, and to be commercially feasible they require a supply of cheap electric power.

The German Example

Fifteen years ago more than half the world's production of fixed nitrogen came from Chile nitrate, and nearly all the remainder from gasworks and coke ovens, the amount obtained by atmospheric fixation processes being trifling. In the next few years these latter processes made considerable strides, but it required the war to bring home to most countries the danger of relying so largely on an external and oversea source such as Chile. Germany was the exception. For years the largest single importer of Chile nitrate, she began by acquiring interests in Scandinavian water-power so that she might command cheap energy for working the electrical processes, which she also developed within her own confines. She realised, however, that these measures did not completely solve the problem of rendering her independent and self-contained in respect of nitrogen supply, and she therefore applied herself assiduously to the development of the Haber process. When she had achieved success she disposed of her interests in Scandinavian water-power—and went to war. It is practically certain that but for the Haber process, worked on a large scale at Oppau and Merseburg, she would not have been able to continue the struggle beyond 1916 from lack of nitrogen for explosives.

During and after the war several countries sought to follow her example. The United States in particular spent immense sums on fixed nitrogen plants, both for ammonia and for cyanamide, but none of them reached full production and most were closed down after the war, so that in 1922 atmospheric nitrogen accounted for only a few per cent. of the American production. The United States Government, however, has not abandoned its interest in the question, and has a Nitrogen Fixation Research Laboratory in active work. In Europe France is endeavouring to establish the manufacture of synthetic ammonia, and variants of the Haber process are being tried in Italy. In point of actual performance, however, Great Britain can now claim first place, Germany always excepted, by reason of the ammonia factory which has been in full operation at Billingham, near Stockton-on-Tees, since the beginning of this year. Already the daily output, in the form of sulphate of ammonia, is from 100 to 120 tons, and it is to be doubled immediately, while the buildings and equipment, which stand on a site having an area of 900 acres, are so planned as to be capable of much greater expansion.

It was on the same site that during the war the Government projected the establishment of ammonia manufacture, but at the time of the Armistice practically nothing had been done. Subsequently it was decided that the enterprise had better be left in private hands, and it was arranged that the development of the industry should be entrusted to Messrs. Brunner, Mond and Co., who for the purpose formed a subsidiary company, Synthetic Ammonia and Nitrates, Ltd., with a capital of five millions. The data accumulated by the Nitrogen Products Committee, who had carried out a large amount of experimental and other work on the nitrogen problem, were handed over to them, though perhaps the chief advantage they derived was that they were able to secure the services of a number of highly qualified chemists and engineers who had served in the Munitions Inventions Department.

The Billingham Plant

The new company proceeded to put up a range of laboratories, probably the finest of their kind in the country, fully equipped for research on both the chemical and the engineering sides. As the result of work carried out in these and of study of the various processes for the fixation of nitrogen, the conclusion was reached that the most suitable process was one based on that of Haber, but modified in important respects. A small plant with a daily capacity of two to three tons of 100 per cent. ammonia was then erected at Runcorn in the works of the Castner-Kellner Alkali Company, the reason for the selection of that place being that a supply of hydrogen was available from the electrolysis of brine. This plant, which was completed in June, 1921, having worked satisfactorily, the erection of the large plant at Billingham was taken in hand. Here many difficulties had to be overcome. To mention one only, the high pressure at which the combination of the gases is effected—200 atmospheres, or, say, 3,000 lb. per square inch—necessitated a special engineering technique, and the company had to make their own designs and to a large extent construct their own plant, the valves, for example, being made in the workshops attached to the laboratories. However, the plant was successfully erected and ammonia was produced about Christmas of last year.

Of the two raw materials required for the synthesis of ammonia, the nitrogen comes from the atmosphere and the hydrogen from water-gas, made from coke. There is a liquid-air plant at the Billingham factory from which nitrogen can be obtained, but in fact the supply is mostly derived from the water-gas plant, the operation of which is so adjusted that the necessary proportion is present in the gas it yields. This gas contains carbon monoxide, which has to be removed. The removal is effected by passing the gas over a catalyst in the presence of steam, when the oxygen of the water combines with the carbon monoxide to form dioxide, while the hydrogen of the water is liberated. The gases next go to compressors which have to deal with something like 5,400,000 cu. ft. a day, and at the first stages of the compression the carbon dioxide is washed out by water under pressure. The compression is then completed, and, the last traces of carbon monoxide having been removed, the gases join the circulation current passing through the ammonia converters, in which, at a pressure of 200 atmospheres and a temperature of about 500° C., with the assistance of a catalyst, a proportion of them is converted into ammonia. This ammonia is washed out by water, and the unconverted gases are returned to the main stream to be again passed through the converters. It may be mentioned, as an improvement upon German practice, that the converters are so arranged that the temperature of their outer walls is kept at or below the boiling point of water,

thus increasing the safety of operation and improving the lasting qualities of the steel of which they are made.

The ammonia liquor thus produced goes to the stock tanks, from which it can be pumped into tank wagons for dispatch. The bulk of it, however, is made into sulphate of ammonia. For this purpose, with the aid of the carbon dioxide obtained at an earlier stage, it is converted into ammonium carbonate, which in turn is mixed with ground anhydrite (calcium sulphate), with the result that calcium carbonate is precipitated and sulphate of ammonia is left in solution. The carbonate is filtered off and sold for the manufacture of cement or as a dressing for land, while the sulphate liquor is evaporated and the crystals are separated by centrifugals and dried. The finished product has the appearance of coarse dry sand, and is quite neutral, no acid having been used in its manufacture. It will be noticed that there is no waste product in the process; even the small amount of sulphur passing into the unconverted gases from the coke is recovered by a wet process, which is the only one of its kind worked in this country. Another interesting circumstance, which apparently was unknown when the Government selected the site, is that there is a deposit of anhydride actually under the works at Billingham.

The next step will be the establishment of a plant for the oxidation of ammonia to nitric acid, with the object of making ammonium and other nitrates. This nitrate plant is to be regarded as a nucleus capable of rapid extension in the event of a national emergency, but before it is put in operation the same course will be taken as was followed in the case of the main ammonia plant—a miniature unit on a semi-technical scale will be erected in the laboratories and run day and night for some months, with the object of training the staff in the operation of the process. The erection of plant for the manufacture of other ammonia products, including urea, is also under consideration.

Chemical Congress at Bordeaux

THE fourth Congress of Chemical Industry (Congrès de Chimie Industrielle), organised by the Société de Chimie Industrielle, Paris, will be held in Bordeaux from June 15 to 21. The programme, in both its professional and its social aspects, is interesting and comprehensive. On Sunday evening, June 15, the Congress will be formally initiated by a *soirée de gala* at the Grand Theatre, and a brilliant reception by the Organising Committee. On Monday, the French Colonial Minister will preside over the opening session, at which M. Dupont, Director of the Institute of Pine, will read a paper dealing with "Maritime Pine and its derivative industries." A visit will be paid to the great Calvet wine vaults. On Tuesday the visitors will be received at the Gironde Naval Dockyards, and in several important industrial establishments. On Wednesday the production of the great wines of the region will be the subject of a lecture by M. Lafforgue, director of the Gironde Agricultural Services, preceded by a boat trip to the Port of Bassens. On Thursday there will be a series of excursions to celebrated châteaux and wine-producing centres. On Friday, the closing day, the visitors will have an opportunity of studying the resin and other industries of the Arcachon district. These are but a very few items in a most varied list, the open-air attractions of which alone furnish the elements of a most agreeable holiday.

The 16 sections of the Congress concerned with work and study are grouped in six divisions—namely: (1) Factory and laboratory, (2) combustibles, (3) metallurgy and mineral industries, (4) organic industries, (5) agriculture and agricultural industries, and (6) economic organisation.

Chemists visiting Bordeaux during the sittings of the Congress and desirous of attending them should communicate with M. Jean Gerard, the General Secretary of the Société de Chimie Industrielle, 49, rue des Mathurins, Paris (8e). M. Gerard—one of the most successful organisers in France—in addition to being the originator of a vast scheme for a National Office of Chemical Research, is a man whose courtesy and readiness to render service is particularly appreciated by foreign chemists. He will be happy to give inquirers all information and facilities in his power. A very useful list of local hotels and prices has been prepared for the use of visitors.

"Chemicals" in the "Empire Series"

To the Editor of THE CHEMICAL AGE.

SIR,—We have read with interest the article by Mr. F. T. T. Reynolds in your issue of May 31, and it is with some diffidence that we venture to comment upon the remarks of so eminent an authority in the world of chemical merchants.

Mr. Reynolds, however, in the course of his article, makes one or two references to our volume on "Chemicals" in the "Resources of the Empire Series," and possibly some reply to these references is called for from us.

The points which your contributor wishes to make are apparently that the interests of the merchants are not sufficiently considered in our volume, that we are not against the Dyestuffs Act, and that we have not dealt with certain obviously important chemicals, such as bichromate of soda and chlorate of soda.

Taking these points in order, it must be understood that all the volumes in this series were written at the request and under the editorship of the Federation of British Industries, to the official of which Federation concerned is attributable the inclusion or otherwise of the introductory articles mentioned by Mr. Reynolds, and the general trend of the volume in this connection. We feel, however, that the editor-in-chief has done his best to hold the balance as fairly as was in his power between the interests of the manufacturer and those of the merchant, and to eliminate as far as possible topics of a contentious character.

Turning now to Mr. Reynolds' statements regarding the Dyestuffs Act, it is surely debatable whether his views are those of the majority of users and sellers of colours or are merely representative of the ideas of a minority. This point cannot be discussed here, but, so far as our book is concerned, we think Mr. Reynolds will agree, on more mature consideration, that a volume published under the auspices of an Association of British Manufacturers, with the furthering of inter-Empire trade as its prime object, is scarcely the place to choose for propaganda against the Dyestuffs Act—or, in other words, in favour of the expansion of commercial relations with countries outside the Empire, and this is the case, without reference to our personal view on the matter.

Your contributor's final point regarding the omission of certain chemicals was, we thought, fully explained in the course of our volume, but in order to make the position quite clear, it may be stated that the Customs classifications are not by any means as comprehensive as they might be, and we considered it inadvisable to deal with an article by name when we were not in a position to give statistics regarding it.

We fully appreciate the many imperfections which exist in our volume, and are gratified for suggestions for its improvement, but, unfortunately it does not lie in our power to obtain statistical information regarding the chemicals named and a number of others, which we consider should be separately classified for Customs purposes. With apologies for trespassing upon your space at this length,—We are, etc.,

H. G. T. BOORMAN.
A. W. ASHE.

37–39, King William Street, E.C.4.
June 11.

Burmah Oilfield Electrification

AT the annual meeting of the Burmah Oil Co., Ltd., held in London on Tuesday, the Chairman, Sir John T. Cargill, referred in very favourable terms to the electrification scheme which has been carried out in the Yenangyaung area. He stated that it was justifying to the full every claim originally made for it. It had completely eliminated from this area the consumption by the company of crude oil as fuel for drilling and operating wells and all other purposes, and the power station itself was supplied with fuel by natural gas from the wells. They had been burning in this way in this area every year crude oil equal to one month's throughput of the refineries, and the older the field got the greater would have been its call for such fuel, so that the great saving and husbanding of resources this development means will be readily appreciated.

South African Cyanide Consumption

DURING 1923 the value of cyanide imported into the Union of South Africa and used for mining purposes was valued at £333,794.

British Empire Exhibition: Chemical Notes

A Week of Conferences on Scientific Industries.

In many ways the Whitsun holiday has been a memorable one at Wembley. Apart from the enormous crowd of visitors who have thronged the grounds and buildings, and the various popular events which have received their fair share of publicity in the daily press, there have been two important conferences dealing with scientific industries. These both opened on Wednesday, and are respectively the joint conference of the Faraday Society and the Textile Institute on "Physical and Physico-Chemical Problems Relating to Textile Fibres," and the Society of Dyers and Colourists' Conference. The last named had two papers on its agenda, one on Wednesday by Mr. J. R. Hannay being "An Historical Survey of Dyeing and Calico Printing," and the other the following day by Professor A. G. Green on "Modern Methods of Dyeing." Between the two meetings, on Wednesday evening the annual dinner of the Society was held at the Hotel Victoria.

The Textile Conference

The Conference held by the Faraday Society and the Textile Institute on Wednesday on "Physical and Physico-Chemical Problems Relating to Textile Fibres" serves to show the immense amount of scientific work which is being done at the present time on the nature of textile fibres. Some dozen papers were presented under the auspices of the Faraday Society dealing with a wide range of subjects ranging from purely theoretical matters, such as Dr. Lawrence Balls' paper dealing with the general aspect of the subject, to practical matters, such as the measurement of transparency of fabrics dealt with by Dr. Thomas Barratt, and the effect of light, by Dr. Guy Barr. These are merely typical examples of the subjects covered. The other papers deal with mercerisation, the properties of silk and flax fibres, the function of water in wet spinning, the absorption and desorption of moisture by textile materials, advances in warp sizing, aircraft fabrics, and so on, all being by eminent men of science associated with the textile industry. An interesting paper was presented also by Dr. Thomas Barratt on "The Fibre Balance" describing one of the forms of instrument which has made much of the accurate research possible, by providing ready means of determining tensile strengths.

Points from Various Papers

In summarising the subject of physico-chemical research on textiles Dr. Lawrence Balls points out that the defects of yarn and fabrics which admittedly exist, together with other defects whose existence is not even recognised, were formerly due to faults in the machinery employed. Many of these have been eliminated in the course of time; and the physicist is now concerned rather with studying the causation of defects which are inherent in the properties of the raw material. The utility of the scientist in industry is largely conditioned by the degree of stability of the industry; and where conditions, methods, and processes are changing—as they appear to be tending to change in textiles—the slow translation of experience by the practical man lags behind the rate of advance required. Rapid accumulation of knowledge, he concludes, can only be made by experiments carried to the *reductio ad absurdum* in all directions.

Dr. S. A. Shorter's paper deals with the subject of the technical properties of fibres such as the absorption of moisture, elasticity and latent strain. He concludes that to explain these properties on a physical theory it must be supposed that fibres consist of an elastic framework with interstices containing a viscous fluid. On this theory, to take one example, the rendering latent of strains by wetting, stretching, and drying stretched, such as occurs in tentering, consists in rendering mobile the gelatinous medium, stretching the framework, and rendering the medium viscous again by drying. The subsequent release of the strain by wetting again is, of course, due to the rendering mobile the medium once more. To render the stretch permanent it would be necessary to attack the actual elastic framework with boiling water or steam.

The Action of Light

One of the most interesting papers was one by Dr. Guy Barr, summarising the work done on the action of light on textiles. Owing to the uncertainty of sunlight in this country the mercury vapour lamp, with a quartz tube, is generally employed, and it has been found that it is the ultra-violet rays which affect the fibres. The paper contains some interesting results showing the decrease in tensile strength of cotton fibres after exposure to light passing through differently coloured glass, red giving markedly the greatest protection. Similarly, experiments have shown that dyeing the fabric red or yellow considerably decreases the effect of sunlight. As to the cause of the loss of strength of cotton on exposure, the general conclusion by various investigators is that the light action induces oxidation of the cellulose. Though the paper contains much further information on the action of light on cotton, it is stated that very little is known definitely of its effects on other fibres. Wool seems to be the least affected, silk very greatly so, but artificial silk only slightly. In all cases it appears to be the ultra-violet rays which have the greatest action, in common with other photo-chemical processes.

The Dyers' Conference

Mr. Hannay's paper on Wednesday at the Society of Dyers and Colourist's Conference dealt with the historical aspects of the art of dyeing and calico printing and traced the growth of the ancient art from the earliest times down to the introduction of modern methods. It proved to be an exceedingly interesting lecture, which was much appreciated by the audience. Professor Green's paper on the Thursday morning was in a sense complementary to it, because he dealt in some detail with scientific methods of dyeing introduced in modern times. Both lecturers were such as would appeal to the general scientific public rather than the technician, and they were fairly well attended. In view of the difficulties involved in giving a lecture in a comparatively remote place such as Wembley, in a hall totally unprovided with heat or water facilities for experimental work, the greatest credit is due to the lecturers in producing such an interesting display. The chair at this conference was taken by the Prime Warden of the Dyers' Company.

Scientific Dyeing

Professor Green made a special point of showing that dyeing is now a highly scientific art, and not dependent, as is so often supposed, upon skill and empiricism. The beginning of the scientific era may be said to have begun with the introduction of synthetic colours. At first there was a set-back in the permanency of the results, but the number of new colours necessitated a close study of their methods of application. An enormous number of dyestuffs are required to produce the required range of shades in each class. The tendency of modern practice is to produce the dye in fibre, which tends to much greater fastness. Again, it has now been found by experience which molecular arrangement in a dyestuff tends to fastness to light. Professor Green illustrated the production of an aniline black, by drying an apparently colourless fabric and then dipping it in a bichromate solution.

In the diazotising and developing process a direct cotton dye is first used, and then this is diazotised and developed to a more complex and therefore more stable structure with greatly increased fastness. The development of primuline in this way was first introduced by the lecturer in 1887, and he demonstrated it in the production of reds, orange and dark blue colours which are known as ingrain dyes. Vat dyeing was also a process of production of the dye in the fibre, in this case of an insoluble dye by oxidation of a colourless soluble leuco base, indigo being the classic example, but now there were others also of various shades, disclosed by the study of indigo. Other vat colours were based on anthraquinone and alizarine, its derivative, and this was demonstrated by dyeing a skein of cotton with flavanthrene yellow, the oxidation of the blue leuco base in the air to yellow being very striking.

Concerning mordant dyes, Professor Green said that now chromium salts were almost the only mordants used by wool dyers, and a whole range of fast dyes was available for use with these salts, which were also demonstrated. Professor Green also referred to the dyeing of acetyl cellulose silk-substitutes which had presented new problems, which had been largely solved with the ionamine dyestuffs, which also exemplified the principle producing the dye in the fibre.

Are Profits Immoral? (VI)

"Buying in the Cheapest and Selling in the Dearest Market"—A Dishonest Travesty of the Facts—Limitation of Production and Its Effects

By Sir Ernest Benn

I REMEMBER when in Washington taking a dollar lecture tour in a char-à-banc to see the sights of the city. The lecturer, who spoke through a megaphone by the side of the driver, pointed out in a somewhat perfunctory manner the White House and other notable features of the capital, but he waxed really eloquent and enthusiastic as he passed house after house of senators and other celebrities, telling us in every case how many million dollars each one was worth. It struck me at first, until I got to know America a little better, as rather remarkable that an out-at-elbow char-à-banc lecturer should exhibit such obvious pride in the millions possessed, or supposed to be possessed, by his fellow citizens. In England we get a totally different picture; here, a man who makes a profit is almost ashamed of it himself, and he is, to a very dangerous extent, an object of scorn or derision in the eyes of some people, and certainly of most politicians.

Are profits immoral? Certain sorts, of course, are. War profits may be cited, for example, and also, perhaps, profits made out of land which are not the result of personal effort put into the land. But these sorts of profits are only the exceptions which prove the rule.

What is profit composed of? How does it arise? Where does it come from? I think, if analysed, it will be seen to consist of three ingredients: (1) the earnings of management, (2) interest on capital, (3) an insurance premium for the risk undertaken. Now each of these ingredients is accepted without question in every walk of life: nobody suggests that any one of them is immoral, yet, when they are lumped together and called profit, we are asked to believe that they constitute an evil which is responsible for the ills with which Society is afflicted, and that in the new world which the doctrinaires will create profit will find no place.

A Popular Argument of the Socialists

Some of the arguments used to bolster up the case against profit will not stand examination. Mr. Sidney Webb and his many literary imitators are never tired of sneering about "buying in the cheapest and selling in the dearest market."

The business man is supposed to be engaged in casting about for someone from whom he can buy at a sweating price, and then searching in the opposite direction for someone from whom he can squeeze an exorbitant figure. There may be business people like that here and there, but it is a dishonest travesty of the facts to suggest that buying in the cheapest and selling in the dearest market is the habit and practice of business. What Mr. Sidney Webb really means is that the business man is engaged in reducing surplus where it exists and relieving scarcity where it is evident.

As an example, let us suppose that plums on a South African farm are worth ½d. a pound, and that they are selling in Covent Garden for 6d. a pound. There we have an example of an embarrassing surplus and a distressing scarcity. The South African farmer is kept poor by the price of ½d. a pound, and the English consumer has to restrict his consumption of plums costing 6d. a pound. There are difficulties at both ends. That is the sort of situation that invites the attention of what the Socialists are pleased to call "that grasping, greedy capitalistic parasite," the business man. If the business man can overcome all the problems associated with the removal of the plums from the South African farm to Covent Garden the price at the one end will begin to go up, and at the other end to go down. Both farmer and consumer will be better off and both will have reason to bless the business agency which intervened to relieve the situation. Nothing but a perverted intelligence can find anything in this state of affairs that could be described as immoral. If the Socialists could show that the plums in South Africa could be carted to Covent Garden by a process which would be more economical than the business man and his profits, their case would be worth examination, but that—unfortunately for them—is a bit of evidence which they lack, and such evidence as exists operates against them.

The Reward of Service

Profit may be defined as the reward of service; it is the only means whereby the community can recognise service. There can be no efficiency, there can be no progress, without profits. While it may appear upon the surface that profit is the incentive of the business man, it is indisputable that he can only make a profit if he will be efficient and render good service.

We human being are funny creatures; we are liable to feel a certain irritation at the thought of another making a profit out of us. We must have our little grumble, or else we do not really enjoy ourselves, but to turn that feeling into a great political movement may be, and is, a very dangerous thing to do.

There is one case where we all desire that the other man shall have his profit, and that is in connection with our insurance. We pay an annual premium for a life insurance in order to get a profit for our dependents if we die young. We know that if we live to a ripe old age we shall lose money, and so in paying for our insurance we do actually, when writing the cheque, give utterance to the wish that the company may make a very good profit on the transaction. We do not take the same view in writing a cheque for the greengrocer or others who serve us, but we should do, for unless the greengrocer makes a satisfactory profit our supplies of greengrocery are in danger, since no piece of business can be really satisfactory unless the supplier has his reward.

Profits can be made in two ways; either by adding to the selling price or by reducing the costs of production. Additions to the selling price can only be made when there is scarcity, and the present habit of the world in the direction of developing scarcity, limiting production, and restricting exchange is creating innumerable opportunities for profiteers to add to prices. Every act which tends to discourage production by anybody swells profits. It is pathetic to the student of these matters to see the labouring classes deceived, by people who ought to know better, into believing that they can improve wages by limiting production. Exactly the reverse is the case, but it is the fact that every such limitation adds to the chances of profit. Profits in the bulk—the best profits, normal profits and the profits of times of prosperity—are made by reducing costs, a process which, once begun, generally improves wages. The whole tribe of economists from the earliest time have never been able to suggest an alternative to profits as a cost reducer. Profit is really the cheapest thing we have; it is the most powerful agent for economy that we yet know. We live each one of us by rendering service to our fellows. We live well or live badly according to the opinions which our fellows form of the service which we render to them.

The Place of the Producer

Any scheme of things which eliminates profit robs the rest of us of the opportunity of expressing our opinion of the service which is offered to us. Through profits we keep the producer in a position of subservience to the consumer; without profits the producer would be top dog, and that is really the position that the Socialists desire to bring about. The weakness of their plan is that unless the producer is in a position of subservience he will not produce. He *says* that he will, and he argues that he will take a higher view of his functions and do better work. This, as a very pretty argument, is worked up by such experts as Mr. Tawney in his *Acquisitive Society*, but it does not ring true.

In doing a piece of work we must keep our minds fixed upon the person for whom we are working, and regard our own convenience as a secondary consideration. Through profits we arrive at that serviceable mental state. Without them, we should forget the consumer and tend to regard ourselves, our job, and our convenience in doing it, as the all-important thing. When ourmin ds start working that way the job suffers. If to these somewhat abstruse arguments is added the unquestionable fact that every material advantage, every domestic amenity, every personal comfort which any one of us enjoys, has always been placed at our service, mixed up with a little bit of profit or a little bit of the desire for profit, how can it be seriously argued that profits are immoral and that they ought to be abolished, or that, indeed, we could live without them?

Sulphuryl Chloride

Controversy between Sir W. J. Pope and American Professors

In the current issue of *Industrial and Engineering Chemistry* an interesting discussion is reported between Sir William Pope, of Cambridge, and Professors R. H. McKee and C. M. Salls, respecting a process for the production of sulphuryl chloride. We give the views on both sides.

Sir William Pope's Case

"In British Patent 122,516, of February 13, 1918, I showed for the first time that the combination of equal volumes of sulphur dioxide and chlorine to form sulphuryl chloride can be induced catalytically by an active form of charcoal; a continuous method for the production of pure sulphuryl chloride was thus devised. Two examples of the manner in which the synthesis could be effected were quoted with the remark that it is to be 'understood that the examples are given by way of illustration and not as limitative.' Example 1 described the formation of sulphuryl chloride by the passage of dry sulphur dioxide and chlorine over the charcoal contained in the cooled U-tube fitted with a draw-off tube for the purpose of continuously draining away the sulphuryl chloride as fast as it is produced. Example 2 runs as follows:

"A cylindrical catalysing vessel made of lead and fitted with an inside lead coil for water-cooling is filled with charcoal, and chlorine and sulphur dioxide gases are led into the lower part of the vessel at as nearly as possible the same volume rates; the gases may be led in separately or after admixture. In a short time the vessel becomes partly filled with liquid sulphuryl chloride and by the provision of a suitably trapped draw-off tube connected to the catalysing vessel at a higher level than that at which the gases enter, the liquid may be drawn off at the same rate at which it is produced. An exit tube for any excess gases is provided at the top of the catalysing vessel and the observation of the colour of the escaping gases indicates whether chlorine or sulphur dioxide is being passed in at too rapid a rate. It is easy to free the produced sulphuryl chloride from excess of either chlorine or sulphur dioxide retained in solution, by addition of the necessary quantity of the deficient component in the presence of charcoal.

"Stated briefly, Example 2 describes the catalytic activity of charcoal in causing the combination of chlorine and sulphur dioxide dissolved in sulphuryl chlorine containing the charcoal in suspension.

"In a recent paper R. H. McKee and C. M. Salls enumerate this patented method for producing sulphuryl chloride among the 'Old Processes,' and comment adversely upon the fact that in its operation 'it is necessary to use equimolecular proportions of the reacting gases'; this drawback is not unconnected with the fact that equal volumes of chlorine and sulphur dioxide alone combine to yield sulphuryl chloride. They then proceed to describe a 'New Process' in the following terms: 'Sulphur dioxide and chlorine are continuously dissolved in a body of liquid sulphuryl chloride which carried activated carbon in suspension. When the reacting substances are nearly pure, the combination takes place rapidly and completely at room temperature. The carbon catalyst effects the combination of the dissolved substances, thus producing fresh solvent. Sulphuryl chloride is removed from the carbon by filtration, and the liquid is run directly into iron drums for shipment.

"I submit that this so-called 'New Process' is entirely identical with that described in Example 2 of the patent. There is no doubt that the method of producing sulphuryl chloride described in the British patent, which has now been allowed to lapse, furnishes the most simple and economical process known for manufacturing a material which should find numerous important applications. In a recent paper [*Rec. trav. chim.*, 42,939 (1923)] I have given further details concerning the preparation of a suitable active charcoal and have indicated how the method can be used conveniently for the small-scale preparation of sulphuryl chloride. Naturally, the operation can be carried out in vessels of glass, lead, iron, or any material that is not acted upon by dry chlorine, sulphur dioxide, and sulphuryl chloride."

Professors McKee and Salls' Reply

"Sir William J. Pope brings out the importance of our improvements. The mere fact that the British patent has been allowed to lapse shows that such improvements were necessary before the Pope process could hope to step out of its laboratory environment. We have laboured long and strenuously to infuse that spark of life which is essential in any commercial undertaking. We refer to economy of production. It will be readily conceded that the cost of production plus the cost of raw materials should be less than the selling price of the product, and up to this date products that may be made from sulphuryl chloride can be made more cheaply in other ways.

"The continuous feature and the use of certain active carbons, though inefficient ones, instead of the charcoal used by Nelsens in 1873, belong to Pope, and constitute important advances. Our improvement of this process by the use of really well-chosen active carbons, our provision for an efficient transfer of heat of reaction, and our use of sulphur burner gas instead of 100 per cent. sulphur dioxide are all new and are the steps which have changed a laboratory process into a commercially useful process. Our second paper showed for the first time why efficient heat transfer was necessary.

"There is nothing in the Pope patent to indicate that the catalysing carbon is suspended in the liquid sulphuryl chloride. The first paragraph of the patent states that the reacting mixture is passed 'over charcoal.' Example 2 states that the lead vessel is 'filled with charcoal' and 'in a short time the vessel becomes partly filled with liquid sulphuryl chloride.' In the light of the results discussed in our second paper it is obvious that dilute sulphur dioxide cannot be used in the Pope process, and that if pure sulphur dioxide were used some of the sulphuryl chloride formed in the better cooled bottom of the lead vessel would be decomposed by the heated carbon in the top of the vessel.

"Since no filtering device is mentioned, we assumed that the catalysing chamber was packed with charcoal in pieces large enough to remain in place, and this has been confirmed by his recent paper. If finely pulverised carbon such as we use were placed in a vessel of his design, it would be washed out very soon by the liquid sulphuryl chloride. There can be no reasonable doubt that Pope would have the carbon catalyst remain in his lead vessel. We have advocated an entirely different arrangement in which the catalyst would be removed continuously from the bottom of a tower, and circulation of the catalyst suspension through the tower maintained by means of a pump.

"Our published results show that decolorising carbons are very much more efficient than the highly activated carbons that were used in military service respirators as advocated by Pope; and therefore we can use a very much smaller quantity of carbon than is recommended by Pope.

"In large-scale operation it would occasionally be desirable to pass into the catalysing chamber a gas mixture containing a large excess of chlorine or sulphur dioxide due to irregular operation of either the chlorine cells or the sulphur burner. In the operation of our process it would be possible to dissolve an excess of either gas for a period of several hours if necessary, later to balance this excess with the other gas. Pope's process cannot use sulphur burner gas at all. It requires pure sulphur dioxide and pure chlorine as starting materials and these must be furnished in 'equimolecular proportions.'

"Finally, it should be pointed out, that, by means of the improvements we have described, the cost per pound of sulphuryl chloride will be reduced to less than half the cost of either of the two pure gases which are required by the Pope process, and further that these improvements in sulphuryl chloride manufacture promise to open up entirely new markets for chlorine."

"The Quest for Colour"

The Quest for Colour, one of the chemical pamphlets issued by Ernest Benn, Ltd. (6d.), has been specially written for the British Chemical Industries Exhibit at Wembley by Dr. A. T. de Mouilpied. Dr. de Mouilpied, who was recently appointed by the Board of Trade to the Dyestuffs Development Committee, is a member of the staff of the British Dyestuffs Corporation, Ltd., and the underlying idea of the pamphlet is the underlying idea of that Corporation. The frequent references in the House of Commons to the immediate future of the British dyestuffs industry give Dr. de Mouilpied's brochure a strong topical interest at the present time.

Palladium and Rhodium Discovery

Occurrence Proved in British Guiana

THE discovery and testing of mineral samples containing palladium and rhodium in British Guiana are described in an official report which has just been published in the British Guiana *Commercial Review*. The mineral was found by a Mr. John Menzies in a diamond-bearing gravel near the Kaieteur gorge, and brought to Sir John Harrison, C.M.G., Director of Science and Agriculture, for examination. Though the quantity available was very small, the report of the tests made is of some interest. The sample consisted, according to the report, of a black concentrate of fine-grained ilmenite sand containing numerous specks of gold. By the aid of a magnifying glass four exceedingly minute fragments of white metal were separated from this concentrate, their total weight being ·012 gramme.

Treatment of the Sample

These fragments were insoluble in hydrochloric acid and in dilute nitric acid, but slowly dissolved in hot concentrated nitric acid. They dissolved slowly in a mixture of concentrated hydrochloric and nitric acids (*aqua regia*) at a temperature of 28° C., producing a rose-red to orange-red solution according to concentrations. After the excess of acid was evaporated away the pinkish red residue, when dissolved in concentrated hydrochloric acid and warmed, produced a deep red-rose liquid. The excess of acid was driven off, the residue was again acidified and evaporated down to dryness, this treatment being repeated three times. The residue was dissolved in water and slowly evaporated down to dryness after the addition of a small excess of ammonium chloride. During this evaporation a very minute amount of dark red ammonium iridio-chloride separated. The double salt obtained after evaporation was readily soluble in water and easily soluble in 80 per cent. alcohol (distinction from platinum). The double salt was decomposed by heat, the black residue ignited at a bright red heat, giving a blackish-grey metallic residue which was found to be in part slowly soluble in *aqua regia* but in part very resistant to it. The acid soluble fraction obtained from the black metallic residue showed only a slightly red coloration when heated with concentrated hydrochloric acid. After the excess of acid had been driven off the yellowish red chloride was dissolved in water and very slowly evaporated with an excess of a solution of potassium chloride, giving a small crop of minute bright red cubical crystals insoluble in a saturated solution of potassium chloride and in absolute alcohol but soluble in water or in dilute alcohol at 28° C. The solution of the chloride in water gave a black precipitate with a solution of potassium iodide, the precipitate being slowly soluble in an excess of the iodide' forming a purple black liquid. Some of the chloride was dissolved in water with addition of alcohol and left to stand for some hours at 28° C., a black metallic precipitate gradually formed which, when dissolved in *aqua regia*, again gave the above reactions, distinctive of palladium.

Some of the almost insoluble metallic residue was brought into solution by repeated treatments with *aqua regia*. The dried product obtained was a yellowish rose-red in colour and when dissolved in concentrated hydrochloric acid and heated produced a deep rose-red liquid while hot, proving the insoluble fraction of the metal to be rhodium.

This was confirmed by preparing the soluble ammonium rhodiohexachloride.

The properties of the metallic fragments and their chemical reactions prove them to consist of a natural alloy of palladium and rhodium not containing any platinum. There was not sufficient of the metallic fragments available to make a quantitative analysis, but the examinations showed that in the different pellets examined the relative proportions of palladium and rhodium varied to a marked extent.

Decline in German Potash

THE American Consul at Berlin states in a report that the eight-month credit granted to German domestic buyers of potash fertilisers from February 4 resulted in an increase of domestic sales of from 24,800 tons pure K_2O in January to 49,500 tons in February. These figures are far behind those for the corresponding months in 1922 and 1923. Domestic sales in January, 1923, totalled 62,950 tons; in February, 1923, 71,612 tons. Domestic sales in January, 1922, amounted to 128,174 tons; in February, 1922, 63,117 tons.

Catalogues Received

"FORESIGHT IN PHOTOGRAPHY" is the title of a beautifully produced little booklet designed to show the amateur photographer the advantages of the scientific methods in exposure, development and after-treatment of photographs such as may be assured by using BURROUGHS WELLCOME AND CO.'S "Tabloid" brand photographic chemicals. Copies, which contain development time tables and other useful information, will be forwarded to readers on application to Snow Hill Buildings, London, E.C.1.

"PATTINSON'S" MAGNESIA, which is mixed and worked up for a large variety of purposes by the WASHINGTON CHEMICAL CO., of Washington Station, County Durham, is the subject of an illustrated art brochure issued by the makers. A valuable feature of the production is the list of products (light and heavy carbonates, fluid, etc.) and the packages in which they can be supplied.

THE THEORY and practice of the automatic hardening of steel are dealt with in the latest catalogue of Wild Barfield automatic electric furnaces, issued by AUTOMATIC AND ELECTRIC FURNACES, LTD., Elecfurn Works, 173–75, Farringdon Road, London, E.C.1. Recent improvements in both mechanical and electrical design have considerably increased the efficiency of these equipments, and it is stated that whereas with electricity at one penny per unit the cost per ton of work hardened has been previously 34s., this figure is now reduced to 26s. per ton.

ELECTRICAL METERS for measuring the flow of steam, water, air, gas or oil which may be applied directly to closed pipes or open circuits are described in leaflets 1, 2 and 3 issued by the ELECTRO FLOW METERS CO., 109, Kingsway, London, W.C.2. The advantages of good flow meters are obvious to plant engineers, and the "Electroflow" is well worth investigation, since there are claimed to be 15,000 in use at the present time.

LABORATORY APPARATUS and fittings are fully dealt with in a new 130-page illustrated catalogue just issued by BROWN AND SON, Alembic Works, Wedmore Street, Holloway, London, N.19. It may be pointed out that the catalogue covers fixtures rather than moveable apparatus, and various types of furnaces, ovens, benches, sinks, pipes and taps form the bulk of the matter included.

THE SUPER-MIXER, a high-efficiency grinding, mixing and emulsifying machine, is described in various forms in illustrated leaflets issued by THOMPSON AND CO., 48, Watling Street, London, E.C.4., who are the sole selling agents. The mills are constructed by the Low Engineering Co., Ltd., and have been designed and tested by Professors Maxwell Lefroy and A. M. Low, and should appeal to many manufacturing chemists who market fine mixed, solid and liquid products.

THE JUNE STOCK LIST of cast iron pipes issued by the STANTON IRONWORKS CO., LTD., of Nottingham, contains particulars of various pipes in stock, either with flanges or straight spigot and socket, but it is stated that owing to the heavy demand for all sizes from 4 in. up to 15 in. no spun iron pipes are available from stock.

A WELL PRODUCED catalogue dealing with "Crown" coverings for boilers, piping, etc., has just been issued by SUTCLIFFE BROS. & BRICE, LTD., of Globe Works, Hyde. This contains useful particulars and illustrations of many installations of these coverings in various parts of steam plant, for the prevention of loss of heat through radiation, with its attendant inefficiency.

Dyers' Wages Discussion

THE representatives of the employers and employees concerned in the wages agreement in the dyeing industry in Yorkshire, Lancashire, Cheshire, and Derbyshire, met in Manchester on Wednesday, June 4, to discuss the application of the Joint Dyers' Executive—representing approximately 80,000 operative dyers—for the termination of the present agreement, an advance of 10 per cent. on base rates for all day workers, the fixing of a minimum for adults of 33s. 3d. per week, and for women 18 years of age and over of 20s. per week, and an alteration of the method of calculating cost of living wages. No report was issued to the Press after the meeting, but the discussion was adjourned, and the two sides will probably meet again shortly.

National Institute of Colloid Research

PLANS to establish a National Institute of Research in Colloid Chemistry, for which a fund of $1,000,000 is sought, is announced by the American Chemical Society, which, with the National Research Council, is supporting the project. The Committee on Colloids of the Council has worked out a tentative scheme for the Institute, which will be located in a university yet to be chosen. "Success," according to the announcement, "means improvements in many industrial processes, more intelligent agricultural practice and, most important of all, the lessening of human suffering through the advances in medical science which will inevitably follow." Application of the principles of colloid chemistry, it is stated, have contributed in a large measure to the solution of important practical problems, including sewerage disposal, insecticides, eradication of the cattle tick, conservation of wood, testing the hardiness of winter wheat, gas adsorption, sorghum syrup manufacture, and fuel. Plans for the Institute contemplate a special laboratory which will be to colloid chemical workers what Wood's Hole is to the workers in biology, and a place where colloid research can be carried out intensively and under proper supervision the year round. It is proposed to vest control of the Institute in a board of seven trustees, one each to be appointed by the National Research Council, the president of the American Chemical Society, the Federation of Societies for Experimental Biology and Medicine, the president of the American Physical Society, and the donor or donors, and two by the President of the university in which the Institute is to be established.

The French Synthetic Resin Industry

THE rapid development of the French synthetic resin industry was signalised in an interesting address to the Society for the Encouragement of (French) National Industry by M. Georges Kimpflin. The lecturer estimated the present production of artificial resin at 100 tons per month—that is, one-fifth of the American and one-third of the German output. A far greater extension is anticipated. This development is due, above all, to the fact that electrical manufacturers demand increasing quantities of "Bakelite" (a product obtained by an application of the method invented and industralised in America by the Belgian, Baekeland). "Bakelite," on account of its powerful dielectric properties—its infusibility and insolubility—is gradually ousting the more popular insulating materials. The other possible applications of synthetic resin are innumerable, but M. Kimpflin discourages all efforts unduly to extend them, declaring that the economic conditions of the development of the industry dictate at present a concentration on the technical perfecting of the applications to which this product is specially suited.

Discussing the question of the chemical composition of "Bakelite," the lecturer admitted that very little was yet known in this respect, that the lack of research hampered any profound study of the subject, and that the industry would gain much if it could acquire scientific knowledge. Be that as it may, the general properties of artificial resin are sufficiently defined to ensure its increasing utilisation and—as a result of its profitable manufacture—to enable France to be no longer dependent, in this domain, on outside supplies.

Chemical Wages Award

THE Industrial Court on Thursday, June 5, issued an award on the chemical workers' application for higher wages. The Court has decided that the wages of adult male time workers shall be advanced 5d. a day or shift; of adult female time workers, 4d. a day or shift; and that piece-workers shall receive equivalent advances. The claim regarding week-end work, they state, has not been established.

The unions asked for an advance of 1½d. an hour for shift workers, and 1d. for day workers, with an increase of 10 per cent. for piece-workers; they also asked that week-end work should be paid for at the rate of double time, a provision which would have affected half the workers concerned in the claim. The employers argued before the Court that the industry as a whole is not in a position to bear an increase in the costs of manufacture. The workers affected by the award number 22,000, of whom 5 to 7½ per cent. are piece-workers.

Ireland and the Safeguarding Act

A COPY of a notice issued by the Revenue Commissioners of the Irish Free State has been received from the Office of the High Commissioner in London, in connection with the proposed abolition of the Customs Duties at present chargeable under the Safeguarding of Industries Act, 1921. This notice states that the Budget proposals contemplate the abolition, as from May 12, 1924, of the Customs duties at present chargeable under the Safeguarding of Industries Act, 1921. This change will not, however, have legal effect before the date on which the Finance Bill becomes law, and, in the meantime, the Revenue Commissioners have no legal authority for refraining from collecting those duties. They are prepared, however, in the case of goods liable to duty under the Act referred to, which are imported in the ordinary course of trade, to accept in lieu of payment of duty an undertaking given by the importer or his authorised agent, on a specified form, to pay the duty in the event of the proposed abolition not becoming legally effective, or of its being made effective from such a date as to render the goods covered by the undertaking eventually liable to duty. Subject to the production of the undertaking in the required form, documentary evidence of the value will not generally be called for in support of the value declared on the Customs entry unless it ultimately becomes necessary to collect the duty.

Availability of Nitrogen in Fertilisers

THE question of the availability of the nitrogen in granular nitrolim formed the basis of a recent dispute between two fertiliser firms. The nitrolim was purchased as a source of readily available nitrogen, but the mixtures in which it was used it was contended failed to give the crop results which the farmer users expected. The examination of the mixtures and of the nitrolim itself showed that the nitrogen was present in each case to the extent of 40 per cent. of its total as dicyanodiamide. The object of the action was, therefore, to prove that the nitrogen was not readily available to crops. The scientific evidence, on which the case was based, was principally the results of research carried out at the Rothamsted Experimental Station by Mr. G. A. Cowie, M.A., B.Sc., F.I.C., who was called as an expert witness. His investigation showed that dicyanodiamide was not only not a plant nutrient, but it was actually harmful to plants when applied in amounts exceeding a certain reasonably low limit. It has afforded no evidence of nitrification even after being six months in the soil. Dicyanodimide was also toxic to the nitrifying organisms in the soil, and thus considerably delayed the production of nitrate from calcium cyanamide. In short, the evidence showed not only that dicyanodiamide was valueless itself as a source of notrogen to plants, but that it slowed down considerably the action of cyanamide. The nitrogen in the case in question could not therefore be called readily available. This was the view taken by the judge.

French Forest Products Development

A FOREST products laboratory is to be set up at Bordeaux as part of the national scheme to render France independent of foreign research. There are to be research and analytical laboratories, provision for instruction of students, inquiry, propaganda and industrial departments. The scope of the work projected is broad. Though situated in the region of the resinous pine, it proposes to treat of all chemical aspects of forest growth in France and the colonies that do not come directly under the direct province of the Department of Forests. The range is from resin and turpentine to tar, wax, lampblack, insulating materials and various essential oils for the perfume and other industries, as well as such new applications as may be worked out for the manufacture of cellulose and paper pulp.

The new bureau is the outcome of a former laboratory instituted by Professor Vezes about 20 years ago and grows immediately out of the work of a national committee formed in 1921. The discoveries of the Bureau des Recherches will not be made public, at least not before having been patented by those interested, thus forming a national industrial clearing house, which may be drawn upon only for the benefit of France and the French.

From Week to Week

OF THE TOTAL OUTPUT of camphor in Japan nearly 85 per cent. is consumed by the United States.

ENGLAND was the second largest purchaser of American rosin during March, Germany being the largest.

THE PRODUCTION of bromine in Germany during 1923 was 1,140 tons, against 1,080 tons in 1922 and 460 tons in 1921.

MR. HENRY FORD'S bid for the Muscle Shoals Power Plant has been rejected by the American Senate Committee of Agriculture.

A PROPOSAL has been made to introduce bio-chemistry and pathology as new subjects in Part II. of the Natural Science Tripos at Cambridge.

TOWARDS THE ESTABLISHMENT of a library for the Cambridge School of Bio-Chemistry Sir Jeremiah Colman has given a donation of £2,000.

PROVISION is made in a Bill recently introduced in the United States Congress for a complete survey of the national resources of mineral potash.

THE APPEAL of the U.S. Government against the Chemical Foundation for the recovery of 4,500 German dye patents will probably be heard in October.

THE BARROW STEEL CO. put into blast this week two furnaces which have been idle since March, and will restart their steel plant as soon as possible.

A MARRIAGE has been arranged between Dr. Charles Best, who co-operated with Dr. Banting in the discovery of insulin, and took a share in the Nobel Prize, and Miss Margaret Mahon, of Toronto.

MR. W. M. CORSE, of the United States National Research Council at Washington, will deliver the Third Annual Autumn Lecture at the meeting of the British Institute of Metals on September 8.

THE NEW STANDARDS of strength of dyes, colours, etc., issued by the American Customs Division, Treasury Department, under the Fordney Tariff Act, have been issued and are now available for the trade.

AN EMPLOYEE in the laundry at the Southern Railway works at Ashford, Kent, fell into a tank of boiling caustic soda on Friday, June 6. He was removed to hospital, but died a few hours after admission.

AMMONIUM SULPHATE deposits have been located in the crater of an old volcano in South Australia about 400 miles north of Adelaide. The ammonium sulphate content is said to be on analysis 95·5 per cent.

THE IRON AND STEEL MAKERS' ASSOCIATION have agreed, after friendly negotiations, to concede 1½d. per hour increase in wages to all bricklayers' labourers employed in the iron and steel works on the North-East Coast.

THE NUMBER OF PERSONS on June 2, 1924, recorded on the registers of Employment Exchanges in Great Britain was 1,002,900. This was 12,726 less than on May 26 and 282,723 less than the figures recorded on December 31, 1923.

THE DIRECTORS of the London and North Eastern Railway Co. have appointed Mr. J. H. B. Jenkins, formerly chemist to the Great Eastern Railway, to be Chief Chemist, and Mr. H. Gripper, formerly chemist to the Great Central Railway, to be Deputy Chemist.

EXPERIMENTS with war poison gases as germicides are being continued in the United States, by the New York municipal health department, the latest substance reported as being tested is mustard gas, which is said to have beneficial results in the correct concentration.

MEISTER, LUCIUS AND BRUNING, members of the German dye cartel, have started a branch company, known as Philana Co., at Basle, Switzerland. The new company is capitalised at one million francs and will co-operate with the Textile Patent Co., of Liestal, Switzerland.

PROFESSOR W. L. BRAGG, Langworthy Professor of Physics in the University of Manchester, is to give the two courses in the summer session of the University of Michigan on (*a*) X-ray crystal analysis and (*b*) recent contributions in the field of X rays and their interpretation.

THE DEATH is announced at Henwick, Worcester, of Mr. W. R. Higgs, who for a long period had been in business as a lead, glass, and colour merchant. Mr. Higgs, who was 71 years of age, had served on the City Council, was high sheriff in 1889–90, and mayor the following year.

PROFESSOR H. S. EDDINGTON and Dr. P. A. MacMahon are to represent the University of Cambridge at the British Association meeting at Toronto in August. After the meeting Professor Eddington will lecture on relativity and sidereal astronomy at the University of California.

IN AN ADDRESS before the National Association of Purchasing Agents, in America, Professor Olney said that it was only necessary for America to import a small percentage of her dyestuffs from Germany. In some cases it was cheaper to do so, and in others they were unable to manufacture the dyes themselves.

DR. F. E. BREITHUT, American Trade Commissioner, in a report on the British dyestuffs industry, states respecting the proposed dye agreement with Germany that it is not likely to be made, at least in its present form, and that considerable further negotiations will be necessary before any agreement can possibly be made.

COLUMBIA UNIVERSITY is abandoning its former six-year courses in engineering and chemical engineering and reducing the full time to five years. This is regarded by our American contemporary, *Chemical and Metallurgical Engineering*, as a retrograde step, it being stated that Colombia graduates command salaries 50 to 100 per cent. above others owing to their superior training.

AMONG THE PAPERS to be presented at the Royal Society on Thursday, June 19, at 4.30 p.m., Lord Rayleigh, F.R.S., will deal with "The Non-luminous Oxidation of Phosphorus in an Oxygen Atmosphere." Sir William Pope, F.R.S., will communicate three papers—(1) by Dr. E. K. Rideal and C. G. L. Wolf on "The Destruction of Rennin by Agitation: A Case of Catalysis at an Air-Liquid Interface"; (2) by W. G. Palmer on "The Use of the Coherer to Investigate Adsorption Films"; (3) by W. G. Palmer and F. H. Constable on "The Catalytic Action of Copper—Part IV."

LORD LEVERHULME, speaking on Tuesday at Newcastle at the Association of Teachers in Technical Institutions, said that he had no prejudice against the university man trained in business, but many who were highly educated took the wrong view. He had known a man with a university education look down upon an ordinary works foreman who had none, and he had known a works foreman who could teach the university man his job blindfold after technical education. It was in the hard school of life that men got the best learning. The Oxford graduate was not a patch on the "hard knocks" graduate.

Society of Dyers and Colourists

THE Society of Dyers and Colourists held their annual dinner on Wednesday evening at the Hotel Victoria, London. Dr. E. F. Armstrong, President of the Society of Chemical Industry, in proposing the toast of the Society of Dyers and Colourists, said they had succeeded in spite of the politician in producing a big proportion of the colours used in Britain and in building up an industry of which they were very proud. The President (Mr. S. J. Pentecost), in responding, said the past ten years had justified the optimism of those who desired to see Britain once again produce the colours needed for her textile industry. It was the duty of the Government of the day to foster and maintain the dyestuffs industry of the country and to encourage research in the coal-tar industry in every way. Mr. L. J. Hunt, Prime Warden of the Dyers' Company, in proposing "Allied Industries," said his company was the oldest connected with the industry, their records going back to the thirteenth century. Mr. H. J. Holroyd, Chairman of the National Federation of Dyers and Cleaners, responded. Amongst others present were Dr. C. Doree, Chairman of the London Section of the Society; Mr. W. J. U. Woolcock, of the Association of British Chemical Manufacturers; Mr. W. W. Leuchars, Benter Warden of the Dyers' Company; and Sir Max Muspratt, Chairman of the Council of the Association of British Chemical Manufacturers.

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Abstracts of Complete Specifications

215,439. Copper Ores, Treatment of. W. J. Mellersh-Jackson, London. From A. A. Ossa, Santiago, Chile. Application date, February 7, 1923.

In this process copper is recovered from copper-bearing material in a cyclic process, employing iodine as a recoverable reagent with the simultaneous production of sulphuric acid. The copper ore is treated with sulphuric acid to obtain a solution of copper sulphate. Sulphurous acid is treated with iodine, yielding sulphuric acid and hydriodic acid in aqueous solution, which reacts with the copper sulphate and precipitates insoluble cuprous iodide, leaving an aqueous solution of sulphuric acid. The acid is filtered off, and may be concentrated or employed for lixiviating a further quantity of ore. The cuprous iodide may be decomposed by means of cupric oxide in a furnace into which a continuous current of air is passed, yielding copper oxide and iodine vapour. The iodine is thus wholly recovered, and may be used again in the process as above. Alternatively, the cuprous iodide may be treated by a wet method with sodium carbonate or caustic soda, yielding cuprous oxide and sodium iodide. In this case the sodium iodide is crystallised and treated with a hot oxidiser such as manganese dioxide, yielding free iodine and alkali manganate. The manganate is then treated with water, yielding insoluble manganic oxide from which the manganese dioxide may be regenerated, and also caustic alkali. The process is thus a cyclic one. If the ore contained lead it is eliminated as insoluble sulphate, while silver may be eliminated from the copper sulphate solution as chloride by adding sodium chloride. The copper oxide produced is periodically drawn off and reduced to copper.

215,463. Fertilising Material, Process for Production of. C. P. Christensen, 34, Havdrupvej, Bronsjoj, Copenhagen. Application date, February 13, 1923.

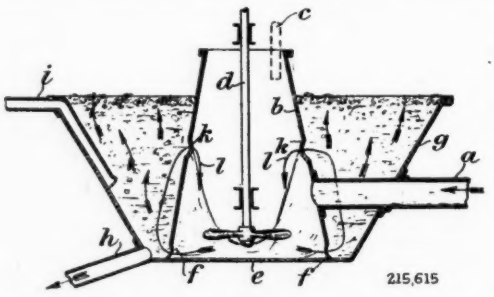
The usual processes for the production of fertilising materials involve a considerable consumption of power, and the object of this invention is to obtain a large yield in simple apparatus with a small consumption of power. A mixture of common salt 100 parts and nitric acid 1–4 parts is placed in a rotary drum, and combustion gases from a furnace are blown into it, together with a hot mixture of boric acid, calcium carbonate, and water, containing 0·25–3 parts of each of these substances. The nitrogen liberated is absorbed by the other material and the resulting mixture forms a highly nitrogenous fertilising material.

215,470. Ammonium Compounds, Manufacture of. J. H. West, 33, Inverness Terrace, Bayswater, London, and A. Jaques, 37, Sandringham Road, Waterloo, near Liverpool. Application date, February 16, 1923.

The process is for obtaining ammonium salts in the solid state, particularly ammonium sulphite or sulphate directly from ammonia and sulphur dioxide. The process is particularly applicable for using synthetic ammonia and by-product ammonia recovered from gasworks, coke ovens, and gas producers. Ammonia and water vapour, with or without finely divided water, are introduced into a mixture of sulphur dioxide and air below 100° C. The concentration of the sulphur dioxide should not exceed 4·2 per cent. of the whole volume, sufficient ammonia is present to render the reaction neutral or slightly alkaline, and insufficient water vapour is employed to render the ammonium sulphite produced sensibly wet after cooling. The amount of water vapour employed is, however, sufficient to render the ammonium sulphite sensitive to rapid oxidation and in a substantially dry state after cooling. A mixture of ammonia and steam may be employed or the mixture may be obtained from an ammonia still. The water may be added as a fine spray of aqueous ammonia solution. The sulphur dioxide may be obtained by burning sulphur pyrites or spent oxide, or by roasting sulphide ores. The degree of dilution of the reacting gases with air is regulated to keep the temperature within the required limits. The excess of ammonia employed is preferably as small as possible—*i.e.*, 0·1 per cent.—and the quantity of steam should be 1·2–1·4 times the amount theoretically necessary for the reaction. In order to obtain the highest yield of solid product it is necessary to cool the mixture to a temperature at which the dissociation pressure of the ammonium sulphite is very small, since the reaction is reversible. This temperature should be preferably about 20°–25° C., but the temperature should be such that sufficient steam to render the product wet is not condensed. The very small quantity of product remaining in the gases is recovered in a Cottrell precipitator or in a suitable filter. The latter may consist of ammonium sulphate a few inches deep. The gases are then passed through a scrubber, where any of the ammonia, sulphur dioxide, or ammonium sulphite remaining is dissolved in water, and when the concentration becomes sufficiently great the solution is transferred to a still to recover the ammonia. The oxidation of the ammonium sulphite may be effected by allowing it to stand in heaps in the air, which are periodically turned over. A dry neutral ammonium sulphate is thus obtained. If the ammonia is obtained from gas liquor or other crude ammonia liquor, it must be purified before using it in this process.

215,615. Refining of Concentrating Coal Slimes and Ores in accordance with the Froth Flotation Process, Apparatus for. J. S. Withers, London. From Vereenigde Kolenmaatschappijen ter Voorzetting der Steenkolenzaken Gedreven Door de Naamlooze Vennootschappen Furness' Kolenmaatschappij en Hoven en Henny's Handelmaatschappij, Konningin Emmaplein No. 1, Rotterdam, Holland. Application date, June 18, 1923.

The ore and water and a froth-producing substance are admitted by a pipe *a* to a mixing vat *b*, or the froth-producing substance may be introduced through a pipe *c*. A vertical



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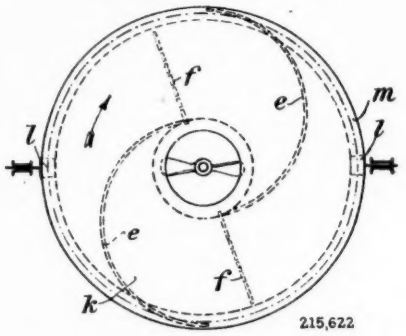
spindle *d* carries a rotating paddle *e* so that the mixture is agitated and forced through openings *f* into a frothing vat *g*. In this vat the velocity of flow is reduced, and the air bubbles carrying the ore particles rise to the top. Part of the liquid returns through the openings *k* to the vat *b*, and part is discharged through an overflow *i*. The provision for circulating the liquid through the openings *f* and *k* facilitates the separation of the ore.

215,622. Skimming off Froth overlaying the Surface of Liquid. A. A. Thornton, London. From Vereenigde Kolenmaatschappijen ter Voorzetting der Steenkolenzaken Gedreven Door de N.V. Furness' Kolenmaatschappij en Hoven en Henny's Handelmaatschappij, 1, Koningin Emmaplein, Rotterdam, Holland. Application date, June 23, 1923.

This apparatus is for removing the froth-containing mineral values obtained in the froth flotation separation process. The illustration shows the froth-containing vat in plan. Two rigid spirally curved blades *e* are mounted for slow rotary movement in the direction of the arrow, and the lower edge of the blades extends below the surface of the liquid so as to force the froth outwards over the edge of the vessel. A number of radial stationary walls *f* are arranged so that their upper edges are above the froth and their lower edges some distance below the surface of the liquid. These walls *f* are adapted to yield in the direction of rotation of the blades *e*, so that the latter can pass over them. Each wall *f* is composed of a number of narrow vertical strips arranged side by side and having hooked portions by which they are suspended on a radial

rod. The froth is thus retained by the wall *f* while the blade *e* is approaching it, and is forced over the outer edge of the vessel. When the wall *f* is slowly deflected by the blade *e*, the liquid is not appreciably agitated, and the froth is not destroyed. The strips of metal may be loaded by means of



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weights or springs, and in an alternative form the walls *f* may be rotated while the blades *e* are stationary. In another alternative, the blades *e* may be yielding and the walls *f* rigid. The blades *e* may be rotated by gearing *l* and *m*.

NOTE.—Abstracts of the following specifications which are now accepted appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention:—197,655 (L. Cassale), relating to the synthetic production of ammonia, see Vol. IX., p. 69; 207,790 (L. Deutsche, I. Thorn and "Amalith" Chemische Industrie Ges.), relating to the hardening of phenol-aldehyde condensation products, see Vol. X., p. 146; 211,494 (Naugatuck Chemical Co.), relating to the compounding of rubber and similar materials, see Vol. X., p. 447.

International Specifications not yet Accepted

213,895. SULPHURIC ACID. Metal Traders, Ltd., 7, Gracechurch Street, London. (Assignees of Metallbank und Metallurgische Ges., 45, Bockenheimer Anlage, Frankfurt-on-Main, Germany.) International Convention date, April 7, 1923.

Gases containing a low proportion of sulphur dioxide are brought into contact with a large quantity of nitrosyl sulphuric acid of low specific gravity, *e.g.*, 58° Bé., but having a high content of oxides of nitrogen. The gases are then brought into contact with a large amount of nitrosyl sulphuric acid of 66° Bé. containing the maximum quantity of oxides of nitrogen.

213,914. CONCENTRATING ACETIC ACID. Fabrique de Soie Artificielle de Tubize Soc. Anon., 3, Rue de Livourne, Brussels. International Convention date, April 4, 1923.

Aqueous acetic acid is distilled with acetone oil or its constituents, *i.e.*, diethylketone, methylpropyl ketone, or methyl isopropyl ketone. Mesityl oxide may also be used. These substances distil over with water at a temperature below the boiling point of acetic acid, leaving the concentrated acid as a residue. The upper layer of the distillate contains the ketones, and may be returned to the still.

213,933. SULPHURIC ACID. Metal Traders, Ltd., 7, Gracechurch Street, London. (Assignees of Metallbank und Metallurgische Ges., 45, Bockenheimer Anlage, Frankfurt-on-Main, Germany). International Convention date, April 7, 1923.

Gases containing sulphur dioxide and oxygen are brought into intimate contact in a mixer with nitrosyl sulphuric acid of such concentration that when the gases are passed into a receiver chamber crystals are deposited. The residual gases are used for the manufacture of sulphuric acid.

213,935, 213,939, and 213,940. ACTIVE CHARCOAL. Algemeene Norit Maatschappij (General Norit Co., Ltd.), 2, Den Texstraat, Amsterdam. (Assignees of J. N. A. Sauer, 2, Den Texstraat, Amsterdam). International Convention date, May 26, 1922.

213,935. The raw material such as coal, brown coal, or coke produced by low-temperature carbonisation of peat, is granulated, and descends in thin layers through a heated retort in contact with the activating gases, which may be superheated steam, carbon dioxide, air, hydrogen, flue gases, combustion gases, etc. The gases may be introduced separately into different zones maintained at the optimum temperatures.

213,939. Spent activated carbon is reactivated by agitating and heating it in contact with the activating gases. The heating may be internal by the injection of hot burning gas, or external, and inorganic impurities may be removed by means of chlorine and sulphur dioxide. The absorbed organic matter is carbonised and consumed.

213,940. Activated charcoal which has absorbed organic matter is suspended in a blast of gas, and subjected to the action of heat and activating gas to carbonise and burn the organic matter. Inorganic impurities may be absorbed by chlorine and sulphur dioxide.

214,196. PURIFYING COAL GAS. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés. G. Claude, 48, Rue St. Lazare, Paris. International Convention date, April 10, 1923.

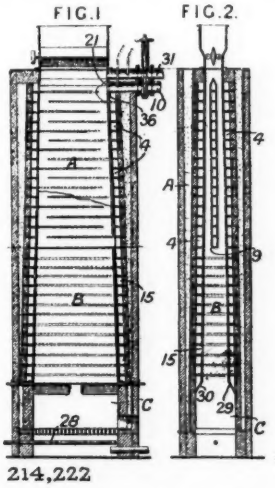
Illuminating or coke oven gas is compressed and cooled and the condensed benzene and other hydrocarbons and water are evaporated. The remaining gas is cooled again and passed through a heat interchanger to remove residual benzene and its homologues. The various condensates may be collected separately in a heat interchanger as described in specification 195,598 (see THE CHEMICAL AGE, Vol. VIII., p. 600), in which the gases circulate upwards and the condensed liquids flow downwards and rectify the ascending gases. A refrigerator may be used for condensing the benzene.

214,210. INDIARUBBER. E. S. A. Cohen, 43, Stadhoudersplein, The Hague, Holland. International Convention date, April 12, 1923.

Rubber latex is mixed with a colloidal suspension of carbon in a fatty acid soap, saponin or other dispersing agent and coagulated. A mixture of rubber and carbon is thus obtained. In an example, a suspension of lampblack in soap is heated to 50° C., mixed with latex, heated to 70° C., and coagulated by alum.

214,222. DESTRUCTIVE DISTILLATION. A. S. Ramage, 7,644, Woodward Avenue, Detroit, Mich., U.S.A. International Convention date, April 9, 1923.

Coal is subjected to low temperature distillation and subsequent gasification. The coal passes downwards through a



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retort A, B, and hot gases generated during the blow period in a producer C pass upwards through tortuous flues 15, and then through flues 4 surrounding the retort A and flues 9 in a hollow partition. The gases enter at 29, 30, and leave at 36, 21 by an outlet pipe 10. Water gas from the producer is passed upwards through the retort, and the mixed gas and distillate passes out through the pipe 31 when the pipe 10 is closed. The retort is wide and flat, so that the charge in the upper part is never far from the hot side walls or the partition.

214,221. ORGANO-METALLIC COMPOUNDS. Standard Development Co., 26, Broadway, New York. (Assignees of C. A. Kraus and C. C. Callis, Clark University, Worcester, Mass., U.S.A.) International Convention date, April 13, 1923.

A finely divided alloy of a metal of the fourth group with an alkali or alkaline earth metal, is treated under pressure with an alkyl halide other than an iodide, and a catalyst such as zinc, or chloride of aluminium or iron. In examples, a tin-sodium alloy is treated with methyl chloride, a lead-sodium alloy with ethyl chloride or bromide, and a lead-sodium-zinc alloy with ethyl chloride. The excess of alkyl halide is distilled off, and the metal aklyl is isolated by steam distillation or extracted by a solvent.

214,224. INDIARUBBER. R. Ditmar, 29, Johann Fuxgasse, Graz, Austria. International Convention date, April 9, 1923.

Rubber latex is mixed with a substance such as cement, gypsum or clay to absorb the water either chemically or mechanically. Colloidal sulphur may also be added to the mixture to obtain a vulcanisable product.

214,237. SYNTHETIC DRUGS. Farbwerke vorm. Meister, Lucius, and Brüning, Hoechst-on-Main, Germany.

An amino-arsenobenzene having as substituent in an amino group a residue containing oxygen such a $CH_2.COOH$, $CH_2.SO_3H$, $CH_2.SO_3H$, COONa, $CH_2.CHOH.CH_2OH$, or SO_3H, is treated with an oxide or hydroxide of copper, silver or gold in neutral or alkaline solution to obtain complex metal compounds of amino-arsenobenzenes. Examples of a number of such compounds are given.

LATEST NOTIFICATIONS.

216,828. Process for the production of viscose. Lilienfeld, Dr. L. May 29, 1923.

216,838. Process for dyeing acityl celluloses or their products of transformation. Farbenfabriken vorm. F. Bayer and Co. May 28, 1923.

216,870. Manufacture of lacquers, paints, or the like. Meter, H. May 28, 1923.

216,882. Process of treatment of carbon and hydrocarbons. Internationale Bergin-Compagnie voor Olie-en Kolen-Chemie. May 31, 1923.

Specifications Accepted with Date of Application

193,866 and 195,600. Azo dyestuffs, Manufacture of. Farbwerke vorm. Meister, Lucius, and Brüning. February 24, 1922, and April 1, 1922. 195,600 addition to 193,866.

194,260. Flotation processes of recovering values from ores Eureka Metallurgical Co. March 4, 1922.

198,332. Sulphuric acid, Manufacture of. W. F. Lamoreaux. May 29, 1922.

199,030. Catalysts for the synthesis of ammonia, Process for the manufacture of. C. Urfer. June 12, 1922.

201,927. Anhydrous tin chloride, Apparatus for the production of. Buss Akt.-Ges. August 4, 1922.

201,935. Ammoniacal liquors, tars, oils, and other liquids obtained in gasworks, Distillation of. A. Cabrier. August 5, 1922.

202,303. Semi water-gas, Apparatus for the production of. E. Fajole. August 8, 1922.

205,502. Anthraquinone series, Manufacture of condensation products of. Farbwerke vorm. Meister, Lucius, and Brüning. October 12, 1922.

206,143. Oxyethyl-arsinic acid, Manufacture of. Etablissements Poulenc Freres and C. Oechslin. October 28, 1922.

206,484. Purifying hydrocarbons, Process of. Barrett Co. November 3, 1922.

209,703. By-products of distillation of coal, Process of and apparatus for the recovery of. Compagnie de Bethune Soc. Anon. January 11, 1923.

216,192. Sulphuric acid, Process and apparatus for making. W. F. Lamoreaux. February 20, 1923.

216,198. Steel, Process for the manufacture of—and the fixation of nitrogen. E. C. R. Marks. (*Nitrogen Corporation.*) February 20, 1923.

216,347. Naphthio-indoxyls, Manufacture of. O. Y. Imray. (*Soc. of Chemical Industry in Basle.*) June 7, 1923.

216,228. Ores and the like, Process of treating. W. F. Gordon and E. W. Keith. February 27, 1923.

216,368. Ethyl chloride, Manufacture of. O. Y. Imray. (*Farbwerke vorm. Meister, Lucius, and Brüning.*) June 26, 1923.

216,389. Alloys. British Thomson-Houston Co., Ltd. (*General Electric Co.*) July 27, 1923.

216,450. Hypochlorites, Manufacture of. Mathieson Alkali Works, Inc. June 27, 1923.

216,462. Oxidised ores, or other oxidised compounds of copper, Treatment of. G. W. Edwards and H. T. Durant. December 27, 1922.

Applications for Patents

Ashanti Goldfields Corporation, Ltd. Ore-roasting furnaces. 13,686. June 4.

Badische Anilin- und Soda-Fabrik and Johnson, J. Y. Treatment of cellulose esters for dyeing. 13,503. June 2.

Bamber, M. K. Manufacture of paints, varnishes, etc. 13,790. June 5.

Bergeret, P., and Dorignac, F. Preservation of organic or vegetable substances. 13,868. June 6.

Blumenfeld, J., and Weizmann, C. Titanium compounds. 13,446. June 2.

Calico Printers' Association, Ltd., and Dawson, F. Scouring and bleaching textile fibres, etc. 13,788. June 5.

Coke, B. E. Oxidation of derivatives of aromatic hydrocarbons. 13,507. June 2.

Coke, B. E. Oxidation of alcohols and aldehydes. 13,555. June 4.

Coke, B. E. Oxidation of toluene. 13,634. June 4.

Eberlein, W. Production of colour lakes. 13,907. June 6.

Helfenstein, A. Metallurgical, etc., hearth furnace. 13,518. June 2.

Heyl, G. E. Distillation of oil shale, etc. 13,891. June 6.

Humphreys and Glasgow, Ltd. Manufacture of gas. 13,616. June 4.

Jackson, W. J. Mellersh-, and Koppers Co. Eliminating hydrogen sulphide, etc., from fuel gases and air. 13,781. June 5.

Lepine, L. J. Desulphurizing, bleaching, etc., fibres, etc. 13,820. June 6.

Nash Engineering Co. Centrifugal pumps. 13,530. June 2. (United States, June 15, 1923.)

Nicklin, M. E. Recovery of creosote oil from crude coal gas. 13,694. June 4.

Paul, A. J. R. Centrifugal pumps. 13,637. June 4.

Rinman, E. L. Dry distillation of alkalized waste liquor from soda-cellulose manufacture. 13,798. June 5. (Sweden, June 6, 1923.)

Soc. Anon. des Pétroles Houilles et Dérivés. Treatment of hydrocarbons. 13,626. June 4. (France, Nov. 11, 1923.)

The Control of Rubber Prices

BRITISH control of the rubber market has been favourably commented upon by the President of the U.S. Rubber Co., Mr. C. B. Seegar, who said that the British plan of regulating rubber production was working nicely for the benefit of the producer and manufacturer. The restriction on production under this plan was not endangering the American supply, although the English and Dutch controlled about 90 per cent. of the world's rubber output. The rubber market was in a fair way to ruin as the result of over-production, until by the restrictive measure imposed by the British the price of rubber was again brought up. Also, under this system the plantation owner and the manufacturer were insured against loss in a market panic. Although the company had a plantation of their own they depend almost entirely on British plantations for their raw material.

Carbon Dioxide for Food Preservation

AN experiment has just been conducted in Nova Scotia consisting of the application of a process of refrigeration, whereby it is stated that carbon dioxide gas is used in place of ice. The trial was made by the Prestwick Air Corporation of New York, under the auspices of the Federal Government, at the premises of the National Fish Company. Over 12,000 lb. of fresh cod and haddock were put into a refrigerator car, and carbon dioxide applied, and the car then sealed and despatched to Montreal. The fact that the consignment arrived at its destination, after a journey of three or four days, as fresh as when taken from the water, has created great interest.

Insecticide Production at Muscle Shoals

THE possibility of manufacturing at Muscle Shoals two chemicals described as destroyers of the peach borer and the boll weevil in conjunction with the production of concentrated fertiliser was announced to the Muscle Shoals committee by Mr. Elon H. Hooker. He said he knew of no reason why calcium arsenate used in combating the boll weevil, and a specific made from chlorine and bleaching soda and acting in the manner of poison gas against the peach borer could not be produced in adequate quantities at Muscle Shoals, U.S.A. Mr. Hooker said research is being conducted in an effort to develop a specific to exterminate wheat rust and tobacco wildfire.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing those firms' independent and impartial opinions.*

London, June 11, 1924.

THERE is not a great deal of interest to report this week as markets have hardly yet recovered their activity after the holidays, while in some of the industrial districts busines. is at a standstill this week.

Prices are in the main firm and the tendency is fairly goods Export demand continues quiet.

General Chemicals

ACETONE is extremely firm for spot delivery and is about £100 per ton. Slightly lower quotations are in evidence for forward delivery.

ACID ACETIC is moderately active and there is evidence of local pressure in one or two quarters. The price may be taken as about £47 to £50 for 80 per cent. pure and £46 to £47 for 80 per cent. technical in casks.

ACID BORIC.—British producers announce a reduction of £3, so that the value for commercial quality is now £45 per ton, with the usual extras for powdered, etc.

ACID CITRIC is unchanged at 1s. 6d. per lb., less 5 per cent.

ACID FORMIC is in moderate demand and is quiet at £60 per ton for 85 per cent., and may be obtained at still less for forward.

ACID LACTIC has been fairly active, and for 50 per cent. by weight £44 per ton is quoted.

ACID OXALIC demand is only moderate, and the price inclined to be easy; it is offered at about 4½d. per lb., but for large quantities this can be shaded.

ARSENIC is lifeless and price reductions have failed to stimulate business. The nominal quotation is round about £50 per ton, for domestic and lower for continental material.

BARIUM CHLORIDE is strong and an active business is reported. The average figure for English material is about £14 per ton and slightly less for continental; delivery of the latter, however, is uncertain.

BLEACHING POWDER is unchanged in value.

COPPER SULPHATE.—There has been a fair inquiry and some good business is reported, especially for Ireland and New Zealand. The value is round about £23 per ton f.o.b.

CREAM OF TARTAR.—Only a moderate business has been transacted and 99/100 per cent. is quoted at round about 85s. per cwt., less usual discount.

CALCIUM CHLORIDE.—English material is unchanged, but Continental material is offered at from £5 5s. to £5 7s. 6d. c.i.f. U.K. port.

FORMALDEHYDE is lower, and can be obtained at £58 per ton ex store.

LEAD ACETATE has been fairly active, and is offered at £47 to £48 per ton for white, while brown is moderately active at £43 to £44 per ton.

POTASSIUM CARBONATE is easy, with little business reported. Small quantities have been sold at £26 to £28 10s. per ton for 96/98 per cent.

POTASSIUM PERMANGANATE has been in better request, and can be quoted at 8d. to 8½d. per lb. for B.P.

POTASSIUM PRUSSIATE.—Demand has been slightly better, and the value may be taken at round about 8½d. to 8¾d. according to quantity and delivery.

SODIUM ACETATE is not quite so active, and perhaps the price may be taken as being a shade easier. The value is from £24 10s. to £25 per ton.

SODIUM BICHROMATE is unchanged at 4½d. per lb.

SODIUM HYPOSULPHITE.—English makers report active business at £10 per ton for commercial; continental could probably be obtained at slightly less.

SODIUM NITRITE is in poor demand and unchanged at £28 per ton.

SODIUM PRUSSIATE has been, if anything, slightly better, but the improvement is so small as not to affect the price, which is moderately steady at 4½d. per lb.

SODIUM SULPHATE (SALTCAKE).—A better trade is reported on export account at £3 per ton f.o.b.

SODIUM SULPHIDE.—British makers' price is unchanged at £14 15s. per ton for concentrated and £9 2s. 6d. for crystals.

ZINC SULPHATE is in poor demand; value about £14 per ton.

Coal Tar Intermediates

There is little of interest to note in this section, and business is mainly of a very small character.

ALPHA NAPHTHOL.—Quiet at 2s. 2d. per lb.

ALPHANAPHTHYLAMINE.—A better business is reported, and the price is steady at 1s. 4½d. per lb.

BENZIDINE BASE is only in small demand, and is quoted at 4s. 4d. to 4s. 6d. per lb. on a basis of 100 %.

METAPHENYLENEDIAMINE is quiet; nominal value 4s. 3d. per lb.

NITROBENZOL is weak and inclined to go lower; value about 5d. per lb. at works.

PARAPHENYLENEDIAMINE.—Only a poor business is reported at 10s. 3d. per lb.

PARANITRANILINE.—Quietly steady, with a moderate turnover at 2s. 4d. per lb.

Coal Tar Products

The market for coal tar products generally is quiet, with little forward business being done.

90% BENZOL is slightly weaker, and is worth 1s. 6d. per gallon on rails.

PURE BENZOL is also quiet, and is worth 1s. 10d. per gallon on rails.

CREOSOTE OIL is in poor demand, the price being weaker. Its value is from 6¾d. to 7d. per gallon on rails in the North, for prompt delivery, while forward deliveries are being offered at a slight discount on these figures. The value in London for prompt delivery is from 7¾d. to 8d. per gallon.

CRESYLIC ACID is firm, the Pale quality 97/99 % being quoted at 2s. to 2s. 1d. per gallon on rails, while the Dark 95/97% is quoted at 1s. 9d. per gallon on rails.

SOLVENT NAPHTHA is unchanged at 1s. 3d. per gallon on rails.

HEAVY NAPHTHA is firm at 1s. 2d. to 1s. 3d. per gallon.

NAPHTHALENES are quiet, the low qualities being worth from £5 10s. to £6 per ton, 74/76 melting point £6 10s. to £7 per ton, and 76/78 melting point £7 to £7 10s. per ton.

PITCH is quiet, and very few transactions have been reported during the last week. To-day's values are more or less nominal at 57s. 6d. to 60s. per ton f.o.b. London, 55s. to 57s. 6d. per ton f.o.b. East and West Coast.

Sulphate of Ammonia

This remains in good demand. Home trade prices are unchanged. Export prices are somewhat easier.

The Price of Radium

THE fear is expressed in *Industrial and Engineering Chemistry*, the official journal of the American Chemical Society, that the discovery of rich deposits of radium ores in the Belgian Congo will result in a virtual monopoly for radium from that country, with consequent high prices which will react unfavourably upon those requring radium treatment for various diseases. Prior to this discovery, it seems, the price of radium in the States was in the neighbourhood of £20 to £24 per milligramme, but with the announcement of the discovery of the above deposits it fell to about £14 per milligramme with the result that American producers in the Denver and other districts had to stop operations. It is alleged, however, that the cost of producing radium from the African ore owing to its extreme richness is only about £1 per milligramme, and the selling price is considered unjustified in view of the fact that the element is so largely used for the alleviation of human suffering.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at sellers' works.

General Heavy Chemicals

Business is maintained at a satisfactory level with a fair export business and very steady values.

Acid Acetic 40% Tech.—£23 10s. per ton.

Acid Hydrochloric.—3s. 6d. to 6s. per carboy d/d., according to purity, strength and locality.

Acid Nitric 80° Tw.—£21 10s. to £27 per ton, makers' works, according to district and quality.

Acid Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 65s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.

Bleaching Powder.—Spot, £11 d/d.; Contract, £10 d/d. 4 ton lots.

Bisulphite of Lime.—£7 per ton, packages extra.

Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)

Calcium Chloride.—£5 17s. 6d. per ton d/d.

Methylated Spirit 64 O.P.—Industrial, 3s. 1d. to 3s. 5d. per gall. Mineralised, 4s. 2d. to 4s. 6d. per gall., in each case according to quantity.

Potash Caustic.—£30 to £33 per ton.

Potassium Bichromate.—5¾d. per lb.

Potassium Chlorate.—3d. to 4d. per lb.

Salammoniac.—£32 per ton d/d.

Salt Cake.—£3 10s. per ton d/d.

Soda Caustic, Solid.—Spot lots delivered, £16 7s. 6d. to £19 7s. 6d. per ton, according to strength; 20s. less for contracts.

Soda Crystals.—£5 5s. to £5 10s. per ton ex railway depots or ports.

Sodium Acetate 97/98%.—£24 per ton.

Sodium Bicarbonate.—£10 10s. per ton carr. paid.

Sodium Bichromate.—4½d. per lb.

Sodium Bisulphite Powder 60/62%.—£18 to £19 per ton according to quantity, f.o.b., 1-cwt. iron drums included.

Sodium Chlorate.—3d. per lb.

Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton ex Liverpool. Nominal.

Sodium Nitrite 100% basis.—£27 per ton d/d.

Sodium Sulphide conc. 60/65.—About £14 10s. per ton d/d.

Sodium Sulphide Crystals.—£9 per ton d/d.

Sodium Sulphite, Pea Crystals.—£15 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—6½d. to 7d. per lb. Demand quiet. Crude 60's, 1s. 9d. to 1s. 10d. per gall. Market flat, only odd lots being offered.

Acid Cresylic 97/99.—2s. 1d. to 2s. 3d. per gall. Demand still good. Market firm. Pale 95%, 1s. 10d. to 1s. 11d. per gall. Steady demand. Dark, 1s. 8d. to 1s. 11d. per gall. Steady business.

Anthracene Paste 40%.—4d. per unit per cwt. Nominal price No business.

Anthacene Oil, Strained.—9½d. per gall. Very quiet. Unstrained. 8½d. to 9d. per gall.

Benzol.—Crude 65's.—10½d. to 1s. per gall. ex works in tank wagons. Standard Motor, 1s. 4½d. to 1s. 6d. per gall. ex works in tank wagons. Pure, 1s. 8½d. to 1s. 10d. per gall. ex works in tank wagons.

Toluol.—90%, 1s. 5½d. per gall. Pure, 1s. 10d. to 2s. per gall.

Xylol Commercial.—2s. 3d. per gall. Pure, 3s. 3d. per gall.

Creosote.—Cresylic 20/24%, 9d. to 9½d. per gall. Few inquiries. Middle Oil, Heavy and Standard Specification, 7d. to 9d. per gall. according to grade and district. Demand not so strong.

Naphtha.—Crude, 8d. to 9d. per gall. Solvent 90/160, 1s. 4d. to 1s. 5d. per gall. Market steady. Solvent 90/190, 1s. 1d. to 1s. 2d. per gall. Market steady. Fair business passing.

Naphthalene Crude.—Drained Creosote Salts, £6 to £6 10s. Demand falling off. Whizzed or hot pressed, £9 to £12 per ton. More inquiry.

Naphthalene.—Crystals and Flaked, £16 to £17 per ton.

Pitch.—Medium soft, 52s. 6d. to 57s. 6d. per ton. Market steadier. Few inquiries for forward delivery. Very little business for prompt.

Pyridine.—90/160, 21s. 6d. to 22s. per gall. Demand well maintained. Heavy, 12s. to 12s. 6d. More business passing.

Intermediates and Dyes

Deliveries are still only required in very small quantities owing to the desire of consumers to keep stocks down.

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 6d. per lb.

Acid H.—4s. 4d. per lb. 100% basis d/d.

Acid Naphthionic.—2s. 4d. per lb. 100% basis d/d.

Acid Neville and Winther.—5s. 8d. per lb. 100% basis d/d.

Acid Salicylic, technical.—1s. 2d. to 1s. 3d. per lb. Steady demand.

Acid Sulphanilic.—10d. per lb. 100% basis d/d.

Aluminium Chloride, anhydrous.—1s. per lb. d/d.

Aniline Oil.—7¾d. to 8½d. per lb. naked at works.

Aniline Salts.—7¾d. to 9d. per lb. naked at works.

Antimony Pentachloride.—1s. per lb. d/d.

Benzidine Base.—4s. 6d. per lb. 100% basis d/d.

Benzyl Chloride 95%.—1s. 3d. per lb.

p-Chlorphenol.—4s. 3d. per lb. d/d.

p-Chloraniline.—3s. per lb. 100% basis.

o-Cresol 19/31° C.—4¾d. to 5¼d. per lb. Demand moderate.

m-Cresol 98/100%.—2s. 1d. to 2s. 3d. per lb. Demand moderate.

p-Cresol 32/34° C.—2s. 1d. to 2s. 3d. per lb. Demand moderate.

Dichloraniline.—3s. per lb.

Dichloraniline S. Acid.—2s. 6d. per lb. 100% basis.

p-Dichlorbenzol.—£75 per ton.

Diethylaniline.—5s. per lb. d/d., packages extra, returnable.

Dimethyaniline.—2s. 4d. per lb. d/d. Drums extra.

Dinitrobenzene.—9d. per lb. naked at works.

Dinitrochlorbenzol.—£84 10s. per ton d/d.

Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works. 66/68° C. 1s. 2d. per lb. naked at works.

Diphenylamine.—3s. per lb. d/d.

Monochlorbenzol.—£63 per ton.

B-Naphthol.—1s. 1d. per lb. d/d.

a-Naphthylamine.—1s. 4½d. per lb. d/d.

B-Naphthylamine.—4s. per lb. d/d.

m-Nitraniline.—5s. 3d. per lb. d/d.

p-Nitraniline.—2s. 4d. per lb. d/d.

Nitrobenzene.—5¼d. to 5½d. per lb. naked at works.

o-Nitrochlorbenzol.—2s. per lb. 100% basis d/d.

Nitronapthalene.—11½d. per lb. d/d.

p-Nitrophenol.—1s. 9d. per lb. 100 % basis d/d.

p-Nitro-*o*-amido-phenol.—4s. 6d. per lb. 100% basis.

m-Phenylene Diamine.—4s. 2d. per lb. d/d.

p-Phenylene Diamine.—10s. 3d. per lb. 100% basis d/d.

R. Salt.—2s. 6d. per lb. 100% basis d/d.

Sodium Naphthionate.—2s. 5d. per lb. 100% basis d/d.

o-Toluidine.—8½d. per lb.

p-Toluidine.—3s. 6d. per lb. naked at works.

m-Toluylene Diamine.—4s. 6d. per lb. d/d.

Wood Distillation Products

There are no alterations to report in the markets for wood distillation products.

Acetate of Lime.—Brown, £14 10s. per ton d/d. Demand active. Grey, £19 to £20 per ton. Liquor, 9d. per gall. 32° Tw.

Charcoal.—£7 5s. to £9 per ton, according to grade and locality. Market steady.

Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall. 24° Tw.

Red Liquor.—10d. to 1s. per gall. 14/15° Tw.

Wood Creosote.—2s. 7d. per gall. Unrefined.

Wood Naphtha.—Miscible, 5s. to 5s. 3d. per gall. 60% O.P. market stiffer. Solvent, 5s. 6d. to 6s. per gall. 40% O.P. Fairly good demand but little offering.

Wood Tar.—£5 per ton.

Brown Sugar of Lead.—£49 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 5¾d. to 1s. 4d. per lb., according to quality. Crimson, 1s. 3d. to 1s. 6d. per lb., according to quality.

Arsenic Sulphide, Yellow.—1s. 11d. per lb.

Barytes.—£3 10s. to £16 15s. per ton, according to quality.

Cadmium Sulphide.—3s. 9d. per lb.

Carbon Bisulphide.—£24 to £26 per ton according to quantity.

Carbon Black.—6½d. to 6¾d. per lb. Market firmer.

Carbon Tetrachloride.—£56 per ton, drums free.

Chromium Oxide, Green.—1s. 3d. per lb.

Indiarubber Substitutes, White and Dark.—4¾d. to 6½d. per lb. Demand very brisk. Prices likely to remain steady owing to firmness of rapeseed oils.

Lamp Black.—45s. per cwt., barrels free. Dearer.

Lead Hyposulphite.—7½d. per lb.

Lithopone, 30%.—£22 10s. per ton.

Mineral Rubber "Rubpron."—£15 10s. per ton f.o.r. London.

Sulphur.—£10 to £12 per ton, according to quality.

Sulphur Chloride.—3d. per lb., carboys extra.

Thiocarbanilide.—2s. 9d. per lb.

Vermilion, Pale or Deep.—4s. 10d. per lb. Easier.

Zinc Sulphide.—7½d. to 1s. 8d. per lb., according to quality.

Pharmaceutical and Photographic Chemicals

Acid, Acetic 80% B.P.—£48 per ton.
Acid, Acetyl Salicylic.—3s. 3d. to 3s. 5d. per lb. In good demand.
Acid, Benzoic B.P.—3s. 9d. per lb. Larger supplies available.
Acid, Boric B.P.—Crystal £54 per ton, Powder £58 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 6½d. per lb., less 5% for ton lots. Market extremely firm. Upward tendency.
Acid, Gallic.—3s. per lb. for pure crystal. Market very steady.
Acid, Pyrogallic, Crystals.—7s. per lb. for 1 cwt. lots. Market firm; increasing demand.
Acid, Salicylic.—Prices quoted from 2s. per lb. down to 1s. 9d. for ton lots. Market weak.
Acid, Tannic B.P.—3s. per lb. Market quiet.
Acid, Tartaric.—1s. 1½d. to 1s. 2d. per lb., less 5%. Better tone, but not yet very active. Cheap offers of second-hand parcels of foreign acid. Higher prices expected in view of firmness of raw materials.
Amidol.—9s. per lb. d/d.
Acetanilide.—2s. 3d. per lb. for quantity. Stocks are small.
Amidopyrin.—13s. 6d. per lb. Neglected. Stocks low.
Ammonium Benzoate.—3s. 3d. to 3s. 6d. per lb. according to quantity.
Ammonium Carbonate B.P.—£37 per ton.
Atropine Sulphate.—12s. per oz. for English make.
Barbitone.—15s. 6d. per lb. Quiet market.
Benzonaphthol.—5s. 6d. per lb. Small inquiry.
Bismuth Salts.—A steady market. Prices according to quantity.
Bismuth Carbonate.—12s. 9d. to 14s. 9d. per lb.
Bismuth Citrate.—11s. 4d. to 13s. 4d. per lb.
Bismuth Salicylate.—10s. 2d. to 12s. 2d. per lb.
Bismuth Subnitrate.—10s. 9d. to 12s. 9d. per lb.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Fluctuating market. Continental prices decidedly firmer. Potassium, 11d. per lb.; sodium, 1s. per lb.; ammonium, 1s. 1d. per lb.
Calcium Lactate.—Demand active. Good English make can be had from 1s. 7d. to 2s. 6d. per lb.
Chloral Hydrate.—3s. 10d. per lb., duty paid.
Chloroform.—2s. per lb. for cwt. lots. Market more active. Makers busy.
Creosote Carbonate.—6s. 6d. per lb. Little demand.
Formaldehyde.—£57 per ton, ex works. English make.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 50%, 2s. 6d. per lb.
Guaiacol Carbonate.—12s. per lb. for cwt. lots. Supplies not plentiful.
Hexamine.—3s. 9d. per lb. for English make. Market dull.
Homatropine Hydrobromide.—30s. per oz.
Hydroquinone.—4s. 3d. per lb. in cwt. lots. Foreign make.
Hypophosphites.—Calcium, 3s. 6d. per lb. for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—2s. 1d. to 2s. 5d. per lb., according to quantity. Advanced by 2d. per lb.
Magnesium Carbonate.—Light Commercial, £36 per ton net.
Magnesium Oxide.—Light Commercial, £75 per ton, less 2½%; Heavy Commercial, £26 per ton, less 2½%; Heavy Pure, 2s. to 2s. 3d per lb., according to quantity. Steady market.
Menthol.—A.B.R. recrystallised B.P., 60s. per lb. Weaker. Synthetic, 26s. to 35s. per lb., according to quantity. English make. Steady demand.
Mercurials.—Market firm. Red oxide, 5s. 3d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 6d. to 3s. 7d. per lb.; white precipitate, 4s. 7d. to 4s. 8d. per lb.; Calomel, 3s. 11d. to 4s. per lb.
Methyl Salicylate.—2s. 3d. to 2s. 9d. per lb. for carboys. A slightly better market.
Metol.—11s. per lb. British make.
Paraformaldehyde.—3s. 6d. per lb. Better inquiry.
Paraldehyde.—1s. 4d. to 1s. 6d. per lb. in free bottles and cases. Better demand.
Phenacetin.—6s. per lb.
Phenazone.—7s. 3d. per lb. for cwt. lots. Quiet.
Phenolphthalein.—6s. 9d. to 7s. 3d. per lb. In more plentiful supply.
Potassium Bitartrate 99/100% (Cream of Tartar).—88s. per cwt., less 2½% for ton lots. Firm market. Prices have upward tendency.
Potassium Citrate.—1s. 10d. to 2s. 2d. per lb. Dearer.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity. Demand continues.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included.
Potassium Permanganate.—B.P. crystals, 8¾d. to 9d. per lb., carriage paid; commercial, 8d. to 8¼d. per lb., carriage paid.
Quinine Sulphate.—2s. 3d. to 2s. 4d. per oz., in 100 oz. tins. Steady market.
Resorcin.—5s. 6d. per lb.
Saccharin.—63s. per lb. in 50-lb. lots.
Salol.—3s. 6d. per lb. Very quiet.
Silver Proteinate.—9s. 6d. per lb.
Sodium Benzoate, B.P.—2s. 6d. per lb. In steady demand for good qualities.
Sodium Citrate, B.P.C., 1923.—2s. to 2s. 3d. per lb., according to quantity. Much firmer in common with other citrates. Prices advanced by 3d. per lb.
Sodium Hypophosphite, Photographic.—£13 to £15 per ton. according to quantity, d/d. consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb. Less for quantity.
Sodium Potassium Tartrate (Rochelle Salt).—77s. 6d. to 81s. 6d. per cwt., according to quantity. Market quiet.
Sodium Salicylate.—Market easier. Powder, 2s. 3d. to 2s. 6d. per lb. Crystal, 2s. 6d. to 2s. 8d. per lb. Flake, 2s. 9d. to 3s. per lb.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb., according to quantity.
Sodium Sulphite, anhydrous, £27 10s. to £28 10s. per ton, according to quantity, 1 cwt. kegs included. In large casks £1 per ton less.
Thymol.—15s. per lb. for good white crystal from ajowan seed. Very firm and scarce.

Perfumery Chemicals

Acetophenone.—12s. 6d. per lb.
Aubepine.—14s. 6d. per lb.
Amyl Acetate.—2s. 9d. per lb.
Amyl Butyrate.—6s. 9d. per lb. Cheaper.
Amyl Salicylate.—3s. 3d. per lb.
Anethol (M.P. 21/22° C.).—4s. 6d. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—3s. 3d. per lb.
Benzyl Alcohol free from Chlorine.—3s. 3d. per lb.
Benzaldehyde free from Chlorine.—3s. 6d. per lb.
Benzyl Benzoate.—3s. 6d. per lb.
Cinnamic Aldehyde Natural.—15s. 6d. per lb.
Coumarin.—20s. per lb.
Citronellol.—16s. per lb.
Citral.—10s. per lb.
Ethyl Cinnamate.—15s. per lb.
Ethyl Phthalate.—3s. 3d. per lb. Reduced.
Eugenol.—11s. per lb.
Geraniol (Palmarosa).—35s. per lb.
Geraniol.—11s. to 18s. 6d. per lb.
Heliotropine.—6s. 6d. per lb. Reduced.
Iso Eugenol.—15s. 9d. per lb.
Linalol ex Bois de Rose.—28s. 6d. per lb. Reduced.
Linalyl Acetate.—28s. 6d. per lb. Reduced.
Methyl Anthranilate.—9s. 6d. per lb.
Methyl Benzoate.—6s. per lb.
Musk Ambrette.—48s. 6d. per lb. Reduced.
Musk Xylol.—16s. 6d. per lb. Reduced.
Nerolin.—4s. per lb.
Phenyl Ethyl Acetate.—12s. 6d. per lb.
Phenyl Ethyl Alcohol.—16s. per lb.
Rhodinol.—57s. 6d. per lb.
Safrol.—1s. 10d. per lb.
Terpineol.—2s. 9d. per lb.
Vanillin.—25s. 3d. to 26s. 6d. per lb.

Essential Oils

Almond Oil, Foreign S.P.A.—15s. 6d. per lb.
Anise Oil.—3s. per lb.
Bergamot Oil.—18s. 6d. per lb.
Bourbon Geranium Oil.—36s. 6d. per lb. Advanced.
Camphor Oil.—75s. per cwt.
Cananga Oil, Java.—10s. 6d. per lb.
Cinnamon Oil, Leaf.—6½d. per oz.
Cassia Oil, 80/85%.—9s. 3d. per lb.
Citronella Oil.—Java, 85/90%, 6s. per lb. Again dearer. Ceylon, 3s. 9d. per lb.
Clove Oil.—7s. 6d. per lb.
Eucalyptus Oil, 70/75%.—2s. 2d. per lb.
Lavender Oil.—French 38/40% Esters, 27s. 6d. per lb.
Lemon Oil.—3s. 2d. per lb.
Lemongrass Oil.—3d. per oz.
Orange Oil, Sweet.—13s. 9d. per lb.
Otto of Rose Oil.—Bulgarian, 27s. 6d. per oz. Anatolian, 23s. 6d. per oz.
Palma Rosa Oil.—19s. per lb.
Peppermint Oil.—Wayne County, 21s. 9d. per lb. Japanese, 18s. 3d. per lb.
Petitgrain Oil.—10s. per lb.
Sandal Wood Oil.—Mysore, 26s. 6d. per lb. Australian, 21s. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

Glasgow, June 11, 1924.

THE Whitsuntide holidays have reflected to some extent on the Scottish chemical market, business having been very quiet during the past week.

Prices both for Home and Continental manufactured products are on about the same level as last reported.

Industrial Chemicals

ACID ACETIC.—Prices slightly easier. Glacial, 98/100% is now quoted at £60 to £67 per ton; 80% pure, £49 to £50 per ton; 80% technical, £46 to £47 per ton; all packed in casks delivered c.i.f. U.K. ports, duty free.

ACID BORACIC.—Remains unchanged. Crystal or granulated, £48 per ton; powdered, £50 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—Still further reduction in price. Quoted 6½d. per lb., carriage paid, or f.o.b. U.K. port.

ACID CITRIC, B.P. CRYSTALS.—Unchanged at about 1s. 6½d. per lb., less 5% ex store spot delivery. Offered for early delivery at slightly less.

ACID FORMIC, 85%.—In moderate demand. Quoted £62 10s. per ton, ex store; 80% quoted about £57 per ton, ex store. Both spot delivery.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy, ex works.

ACID NITRIC, 80°.—£23 10s. per ton, ex station, full truck loads.

ACID OXALIC.—Spot material unchanged at about 4¾d. per lb., ex store, but very little demand. Still on offer from the Continent at about 4½d. per lb., c.i.f. U.K. port.

ACID SULPHURIC.—144°, £3 12s. 6d. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality 20s. per ton more.

ACID TARTARIC B.P. CRYSTALS.—Unchanged at about 1s. 2½d. per lb., less 5% ex store. Offered for early delivery at about 1s. 1½d., less 5% ex wharf.

ALUMINA, SULPHATE, 17-18%, IRON FREE.—Quoted £7 15s. per ton, ex store spot delivery. Offered for early delivery at about £7 2s. 6d. per ton, c.i.f. U.K. port.

ALUM, CHROME.—Ammonium chrome alum quoted £19 to £21 per ton, according to quality, f.o.b. U.K. port. Potash chrome alum of English manufacture about £26 5s. per ton, ex store. Continental potash chrome alum offered at about £25 10s. per ton, c.i.f. U.K. port.

ALUM, POTASH (LUMP).—Unchanged at £10 10s. per ton, ex store, spot delivery. Offered from the Continent at about £9 10s. per ton, c.i.f. U.K. port.

AMMONIA, ANHYDROUS.—Unchanged at about 1s. 5½d. per lb., ex station, prompt delivery.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton, packed in 5 cwt. casks, delivered U.K.

AMMONIA LIQUID, 880°.—Unchanged at 2½d. to 3d. per lb., delivered, according to quantity. Containers extra.

AMMONIA MURIATE.—Grey galvanisers' quality of English manufacture quoted £30 per ton, ex station. Fine white crystals of Continental manufacture on offer at £25 15s. per ton, c.i.f. U.K. port, prompt shipment. Spot lots about £28 per ton, ex store.

AMMONIA SULPHATE.—25¼%, £13 12s. per ton; 25¾%, neutral quality, £14 15s. per ton, ex works, prompt delivery.

ARSENIC, WHITE POWDERED.—Quoted £51 per ton, ex wharf. Continental on offer at about £48 per ton, c.i.f. U.K. port.

BARIUM CARBONATE, 98-100%.—Continental material offered at £11 5s. per ton, c.i.f. U.K. port, prompt shipment.

BARIUM CHLORIDE, 98-100%.—English material unchanged at about £14 per ton, ex store. Offered from the Continent at about £3 5s. per ton, c.i.f. U.K. port.

BARYTES.—Finest English white—quoted £5 5s. per ton, ex works; Continental about £5 per ton, c.i.f. U.K. port.

BLEACHING POWDER.—Spot lots, £11 per ton, ex station. Contracts 20s. per ton less.

BORAX.—Prices remain unchanged. Granulated, £24 10s. per ton; crystals, £25 per ton; powdered, £26 per ton, carriage paid U.K. station, minimum ton lots.

CALCIUM CHLORIDE.—English material unchanged at £5 12s. 6d. per ton, ex station. Quoted £5 per ton, c.i.f. U.K. port, prompt shipment from the Continent.

COPPERAS GREEN.—Unchanged at about £2 5s. per ton, f.o.b. U.K. port in bulk. Quoted £3 5s. to £3 10s. per ton, in casks.

COPPER SULPHATE.—Moderate inquiry for export. Quoted £24 per ton, f.o.b. U.K. port.

FORMALDEHYDE, 40%.—Spot lots now offered at £57 per ton, ex wharf. Quoted £54 per ton, c.i.f. U.K. port, June shipment.

GLAUBER SALTS.—English material quoted £4 per ton, ex store or station. Continental on offer at about £3 10s. per ton, c.i.f. U.K. port.

LEAD, RED.—Continental material advanced to about £37 per ton, ex store, spot delivery.

LEAD, WHITE.—Now quoted £44 per ton, ex store, spot delivery.

LEAD ACETATE.—White crystals quoted £48 10s. per ton, ex store, spot delivery. On offer from the Continent at about £47 5s. per ton, c.i.f. U.K. port. Brown crystals offered from the Continent at £43 5s. per ton, c.i.f. U.K. port.

MAGNESITE, CALCINED.—English ground material offered at £8 per ton, ex station. Moderate inquiry for export.

MAGNESIUM CHLORIDE.—Spot lots available at £4 per ton, ex store. Offered from the Continent at £3 7s. 6d. per ton, c.i.f. U.K. port.

MAGNESIUM SULPHATE (EPSOM SALTS).—English material quoted £4 15s. per ton, ex store, spot delivery. B.P. quality on offer at about £6 5s. per ton, ex station.

POTASH CAUSTIC, 88/92%.—Quoted £30 per ton, ex store, spot delivery. Slightly cheaper quotations from the Continent. Now quoted £29 5s. per ton, c.i.f. U.K. port.

POTASSIUM BICHROMATE.—Unchanged at 5¾d. per lb., delivered.

POTASSIUM CARBONATE.—96/98% quoted £24 10s. per ton, c.i.f. U.K. port. Spot lots on offer at £26 10s. per ton, ex store.

POTASSIUM CHLORATE.—Spot lots on offer at 3d. per lb., ex store.

POTASSIUM (SALTPETRE).—Quoted £30 10s. per ton, ex store, spot delivery. Offered from the Continent at £27 5s. per ton, c.i.f. U.K. port.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 8¼d. per lb., ex store, spot delivery. Commercial quality about 7½d. per lb., ex store. B.P. crystals offered from the Continent at 7d. per lb., c.i.f. U.K. port.

POTASSIUM PRUSSIATE (YELLOW).—Unchanged at about 8½d. per lb., f.o.b. U.K. port, or ex station.

SODA CAUSTIC.—76/77%, £19 7s. 6d. per ton; 70/72%, £17 17s. 6d. per ton; 60/62% broken, £19 2s. 6d. per ton; 98/99%, powdered, £22 15s. per ton. All ex station, spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—Now quoted £22 15s. per ton, c.i.f. U.K. port. Spot lots on offer at about £24 15s. per ton, ex store.

SODIUM BICARBONATE.—Refined recrystallised quality £10 10s. per ton, ex quay or station, M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—English makers' prices unchanged at 4½d. per lb., d/d.

SODIUM CARBONATE.—Soda crystals, £5 to £5 5s. per ton, ex quay or station. Alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English material unchanged at £10 per ton, ex station. Continental offered at about £9 per ton, c.i.f. U.K. port. Pea crystals of English manufacture quoted £13 15s. per ton, ex station.

SODIUM NITRATE.—95/96% quality quoted £13 10s. per ton, f.o.r. or f.o.b. U.K. port; 96/98%, 7s. 6d. per ton extra.

SODIUM NITRITE.—Now on offer at £27 15s. per ton, f.o.b. U.K. port.

SODIUM PRUSSIATE (YELLOW).—Unchanged at about 4½d. per lb., ex station or f.o.b. U.K. port.

SODIUM SULPHATE (SALTCAKE).—Price for home consumption £3 10s. per ton, carriage paid buyer's station, good inquiry for export and price about £3 per ton. f.o.b. U.K. port.

SODIUM SULPHIDE.—60/65% Solid, English make, £14 15s. per ton, ex station; broken, £1 per ton more; flake, £2 per ton more; 60/62% solid, offered from the Continent at £12 10s. per ton, c.i.f. U.K. port; broken £1 per ton more. 31/34% crystals, English make, £9 2s. 6d. per ton, ex station; 30/32% crystals, Continental make, £8 12s. 6d. per ton, c.i.f. U.K. port.

SULPHUR.—Flowers, £10 per ton; roll, £9 per ton; rock, £9 per ton; ground, £8 per ton. Prices nominal.

ZINC CHLORIDE 98/100%.—Quoted £26 15s. per ton, f.o.b. U.K. port.

ZINC SULPHATE.—English material quoted £13 10s. per ton, ex station. Offered from the Continent at about £11 per ton, c.i.f. U.K. port.

Coal Tar Intermediates and Wood Distillation Products

BETA NAPHTHOL.—Export inquiry. Price remains firm at 1s. 1d. lb., f.o.b.

CLEVES ACID.—Home inquiry. Price 3s. 3d. lb., 100% basis.

DIMETHYLANILINE.—Some export inquiry. Price 2s. 4d. lb., f.o.b., drums included.

FREUNDS ACID.—Home inquiry. Price 5s. lb., 100% basis.

PARA NITROTOLUOL.—Export inquiry. Price 2s. lb., f.o.b.

RESORCIN.—Home inquiries. Price 3s. 10d. lb., delivered.

S S ACID.—Export inquiry. Price 14s. lb., 100% basis, f.o.b.

Company News

NOBEL INDUSTRIES, LTD.—The transfer books for the ordinary shares will be closed from June 17 to July 1, both days inclusive.

AMERICAN CYANAMID CO.—A dividend of $1½ per share has been declared on the preferred stock and $1 per share, plus $½ extra, on the common stock, payable on July 1.

SHAWINIGAN WATER AND POWER.—The directors have declared a dividend on the common shares of $1¾ per share for the quarter to June 30, payable on July 10 to holders of record on June 24.

SHAMVA MINES.—An interim dividend of 5 per cent., less tax at 2s. 3½d. in the £ has been declared for the current quarter (being the second interim dividend for the year to December 31, 1924), payable on July 10.

ASBESTOS CORPORATION OF CANADA.—Cabled advice states that the directors have declared a dividend of 1½ per cent. on the preferred stock for the quarter ending June 30, payable on July 15 to holders of record on July 1.

THE WALL PAPER MANUFACTURERS, LTD.—The ordinary share registers of the company will be closed from June 16 to June 30, both days inclusive, for the payment of an interim dividend for the year ending August 31, 1924.

CAPE EXPLOSIVES WORKS, LTD.—The transfer books of the 5½ per cent. first mortgage debenture stock will be closed from June 17 to 30, both days inclusive, for the purpose of preparing the half-yearly interest warrants, payable on July 1.

THE ASSOCIATED PORTLAND CEMENT MANUFACTURERS, LTD.—The transfer books and register of members of the company's first mortgage 4½ per cent. debenture stock will be closed from June 17 to 30, both days inclusive, for the preparation of the half-yearly interest warrants.

ZINC CORPORATION.—The profit for the year 1923 is £295,328, to which is added appropriations for development, etc., at December 31, 1922, unexpended and now written back, giving a total of £313,580. A final participating dividend of 2s. per share is payable on June 19, and a balance of £19,756 is to be carried forward.

SCOTTISH OILS, LTD.—Sir John Cargill, presiding at the annual meeting at Glasgow, on Wednesday, said the year had been a trying one for their subsidiary companies engaged in the shale industry. Depression in the markets had resulted in a reduction of income of approximately £450,000, and coal had cost about £100,000 more than in the previous year.

UNITED INDIGO AND CHEMICAL CO., LTD.—At a meeting of the directors held on May 27 it was decided that a dividend at the rate of five per cent. per annum, subject to income tax at 4s. 6d. in the £, for the six months ending June 30, be paid in respect of the preference shares, and that the preference transfer books be closed from June 23 to 30 inclusive.

PEASE AND PARTNERS, LTD.—A circular has been issued to the shareholders regarding the issue of new capital. The authorised share capital of the company is £3,000,000 in shares of £1 each, of which 2,203,857 have been issued and are fully paid up, and the directors have resolved to issue the balance of 796,143 shares of £1 each. The whole of the new shares are offered in the first instance at par to the shareholders registered in the books of the company on May 27.

W. J. BUSH AND CO.—The accounts for the year 1923 show a gross profit of £249,885. After providing for debenture interest, expenses, and directors' remuneration, and making allowances for depreciation, the net profit is £48,109, and £18,197 was brought in, making a total of £66,306. After paying the preference dividends the directors recommend a final dividend of 7 per cent., on the ordinary shares, making 10 per cent. for the year, leaving £35,056 to be carried forward.

Recent Wills

Mr. J. H. Kenworthy, of Rochdale, Lancs, manufacturing chemist	£17,608
Mr. John Cooke Hewlett, Hillside House, Beckenham, Kent, of C. J. Hewlett and Son (Ltd.), manufacturing chemists	£144,711
Mr. Ernest Edwin Dent, of Claremont, 8, Westcliffe Grove, Harrogate, director of Dent, Son and Co., Ltd., tar distillers	£4,061

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, 51 and 52, Chancery Lane, W.C.2, from whom further information may be obtained.

Opposition to the Registration of the following Trade Marks can be lodged up to July 11, 1924:—

"CHARNIT."

447,072. For a chemical preparation for use in destroying weeds and as a fertiliser. Thomas Vickers and Sons, Limited, Phosphate Works, West Bank Dock, Widnes, Lancashire, compound fertilisers and phosphate manufacturers. April 2, 1924.

"REZOREX."

447,299. For hydrated lime fertiliser, for agricultural and horticultural purposes. Harvie, Linton and Co., Limited, 11, Queen Victoria Street, London, E.C.4, merchants. April 9, 1924.

"SALZIUM."

447,572. For chemical substances prepared for use in medicine and pharmacy. Henry J. Smith (Chemists), Limited, 2, Stanley Road, Acton, London, W.3, wholesale chemists. April 17, 1924. (To be associated. Sect. 24.)

"OSTELIN."

447,886. For chemical substances prepared for use in medicine and pharmacy. Joseph Nathan and Co., Limited, 16, St. Helen's Place, London, E.C.3, merchants. April 29, 1924. (To be associated. Sect. 24.)

"VAENGALED."

447,794. For raw or partly prepared vegetable, animal and mineral substances used in manufactures, not included in other classes. The Abergynolwyn Slate and Slab Co., Limited, The Wharf, Towyn, Merioneth, manufacturers. April 25, 1924. (To be associated. Sect. 24.)

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

WATER FILTERS FOR EGYPT.—The Ministry of the Interior at Cairo are calling for tenders relative to the installation of water filters, etc. (Reference No. A.X./1043.)

TENDERS INVITED FOR STEAM BOILER PUMPS, ETC.—The Commercial Secretary at Buenos Aires reports that tenders are being called for in respect of a steam boiler, six steam injection pumps, and other steam supplies required by the Department of Mines, Geology and Hydrology of the Argentine Government. (Reference No. A.X./1044.)

DEMAND FOR VARNISH IN BRITISH INDIA.—The Director-General, India Store Department, Branch No. 10, Belvedere Road, Lambeth, S.E.1, requires 9,900 gallons of varnish of various descriptions. Tender forms may be obtained on application to the Director-General at the above address.

Tariff Changes

AUSTRALIA.—Dumping duties have been applied to linseed oil from Great Britain, the c.i.f. and duty-paid cost of which is less than the Australian manufacturer's selling price. Permanganate of potash, B.P. from Czecho-Slovakia is now also liable to dumping duty.

UNITED STATES OF AMERICA.—Under the provisions of the flexible tariff the import duty on barium dioxide has been increased from 4 to 6 cents per pound.

SYRIA AND LEBANON.—Alcohol, not denatured, may be imported by makers of chemical products, perfumery, and pharmaceutical products at a reduced rate of 11 per cent. *ad valorem* under conditions to be prescribed by a subsequent Decree.

Greek Customs Tariff

A FULL translation of the new Greek customs tariff, portions of which are to be brought into operation by Decrees on the proposal of the Council of Ministers appears as a supplement to the *Board of Trade Journal* of June 5. The list contains some 150 items dealing with chemicals and pharmaceutical products, perfumes, dye and colour.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that occur.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

GREENHALGH (HUGH) AND CO., LTD., Burnley, dyers. (M., 14/6/24.) Registered May 22, £3,000 and further advances mort., to Building Society; charged on 1, Manchester Road, and 1, Vine Street, Nelson. *Nil. November 23, 1922.

YORKSHIRE COKING AND CHEMICAL CO., LTD., London, S.W. (M., 14/6/24.) Registered May 29, £3,750 debentures dated July 17, 1917, part of £55,000; general charge. *£55,000. June 20, 1923.

Satisfaction

YORKSHIRE COKING AND CHEMICAL CO., LTD., London, S.W. (M.S., 14/6/24.) Satisfaction registered May 29, £55,000, registered November 13, 1915, to May 29, 1924.

Receivership

NICOL RULE AND CO., LTD. G. D. Haynes, of 97, Mortimer Street, W.1, ceased to act as Receiver or Manager on May 27, 1924.

London Gazette

Companies Winding Up Voluntarily

LONDON HYGIENIC CHEMICAL CO. (1922), LTD (C.W.U.V., 14/6/24.) E. C. Gardner, 6, Cumnor Road, Sutton, appointed liquidator.

STANDAR CHEMICAL ENGINEERING CO., LTD. (C.W.U.V., 14/6/24.) By an Order of Court, May 28, Harold Moore, 3, Thames House, Queen Street Place, London, Chartered Accountant, appointed liquidator in place of Reginald Guy Sidford, the liquidator appointed by the company.

WEST BANK ALUM CO., LTD. (C.W.U.V., 14/6/24.) T. Pemberton, Bewsey Chambers, Warrington, appointed liquidator.

Bankruptcy Information

WEBB, Charles, 99, Great George Street, Liverpool, chemical manufacturer. (R.O., 14/6/24.) Receiving order, June 2. Creditor's petition.

Application for Discharge

CURTIS, William Henry, Atlas Chemical Works, New Mills, in the county of Derby, trading as W. H. CURTIS AND CO., manufacturing chemist. (A.F.D., 14/6/24.) Hearing, June 24, 12 noon. Court House, Vernon Street, Stockport.

Partnerships Dissolved

PREMIER DYEING AND DRY CLEANING CO. (David McPHERSON and James TURNER), dyers, dry cleaners, and laundrymen, Premier Dye Works, Park Road, Aston, by mutual consent, as from December 31, 1923. Debts received and paid by J. Turner, who will carry on the business on his own account.

VICTORIA PAINT CO. (Sydney William STEER, Albert Charles PRICE, and Frederick John LANE), 4 and 6, Spring Street, Bristol, oil and varnish manufacturers, from April 30, 1924, by mutual consent, the business will be carried on by S. W. Steer and A. C. Price. Debts received and paid by them.

New Companies Registered

CALLINGTON ARSENIC CO., LTD., Gang Mine, St. Ives, Cornwall. To acquire the business of mineral dealer and mining rights proprietor. Nominal capital, £1,000 in 10s. shares.

CONTINENTAL AND AMERICAN CORPORATION, LTD., 109, Kingsway, London, W.C.2. Technical research chemists, drysalters, metallurgists, importers and manufacturers of industrial and other preparations, tar products, oils, and chemicals, etc. Nominal capital, £15,000 in £1 shares.

CROFT HOLDEN TAR GRANITE CO., LTD., West Bank, Widnes. Importers, manufacturers and factors of and dealers in tar, macadam, and other road materials; manufacturers of and dealers in coal tar, pitch, etc. Nominal capital, £20,000 in £1 shares.

FUMIGATORS CHEMICALS, LTD., 232, Salisbury House, London, E.C.2. Manufacturers, refiners, producers, importers and exporters of, miners for and dealers in hydrocyanic acid, cyanamid, cyanide, and other chemicals and chemical products, oil refiners, distillers, and manufacturers, etc. Nominal capital, £15,000 in £1 shares.

LONDON CHEMICAL CO., LTD. Manufacturing chemists and druggists, drysalters, etc. Nominal capital, £5,000 in 5s. shares. Solicitor: F. H. Stollard, 56, Gresham Street, London, E.C.

J. C. ROGERS AND CO., LTD., 5-8, New Martan Street, London, E.C.1. Oil extractors and refiners, bone merchants and crushers, glue manufacturers, etc. Nominal capital, £5,000 in £1 shares.

Cancelling an Order by Telephone

JUDGE SNAGGE, in the Bow County Court, on June 6, gave a decision of considerable importance to business firms, with reference to the legality of cancelling an order over the telephone which only two hours previously had been given at the firm's offices. The plaintiffs, J. Evershed & Co., manufacturing stationers, sued Mr. C. Belsher to recover £4 8s., the value of some calendars printed and delivered last December. It was stated that the defendant did not deny having given the order to the plaintiffs, but two hours after leaving plaintiff's premises he rang up to cancel it. The reply was "Very well," and he thought that ended it. The defendant said he did not think it necessary to write, as the order was cancelled two hours after it was given. He told a traveller that he had cancelled it. The traveller admitted this.

Judge Snagge said he thought it unwise to leave such a matter to a telephone message, and asked what the legal position would be if he accepted the word of the defendant that he telephoned.

The plaintiffs submitted that a telephone cancellation alone was not effective

Judge Snagge: I regretfully come to the conclusion that the plaintiffs must recover. They say that a telephone cancellation is not sufficient, and I have to agree that I do not think that it would hold in law. The telephone might be used to start with, but it should be followed by a cancelling letter. I much regret that the defendant should have to pay, but I must find for the plaintiffs with costs. I suggest, however, that the plaintiffs' counsel would be wise if he advised his clients not to press for payment under the circumstances, as I accept the defendant's word that he did telephone the cancellation.

Devon and Cornwall Paint Co. in Liquidation

IN the compulsory liquidation of the Devon and Cornwall Paint Co., Ltd., Sea King Works, Poole, Dorset (see THE CHEMICAL AGE, May 10, p. 504), the Official Receiver has now issued to the creditors and to the shareholders a summary of the company's statement of affairs, and this discloses liabilities £18,519, of which £7,891 are returned as expected to rank, and assets £7,141 net. A deficiency of £750 is accordingly shown in relation to the creditors, while with reference to the shareholders a total deficiency of £16,475 is shown. The failure of the company is attributed by the directors and secretary to insufficiency of capital coupled with heavy expenditure on premises, machinery and plant, to inability to realise the company's property at High Street, Poole, and also to the commencement of proceedings by a director for repayment of his loan to the company, the effect of this having been to destroy the company's credit. In the opinion of the Official Receiver the company's failure is also due to the expenditure of its funds on premises (at High Street, Poole) unsuitable for its purposes, to expenditure on the Sterte premises when the company were short of money, and also to the sale of its manufactures at unremunerative prices. The Court has appointed Mr. Sydney R. Pettitt, incorporated accountant, of 45 and 47, Old Christchurch Road, Bournemouth, as liquidator of the company, with a committee of inspection.